George Gatton Hardingham.

EX BIBLIOTHECA

CAR. I. TABORIS.

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Dr. Erasmus Darwin -

from Sketch by S. T. Hall -

"Shortly after the publication of The "Botanic Garden" appeared his "Zoonomia," or the Laws of Organic Life" in two volumes at intervals of two years, for which he had been gathering materials not less than 23 yrs. In the latter work is enunciated the theory of "progressive development from the fibre to the tree, the dog, the horse &c, & finally to man.. He was one of those who argue that it in no wise derogates from God's glory that many things should not have been produced spontaneously but that it is much more glorious to be the "Cause of Causes."

This doctrine has ~~been~~ more
recently been very cleverly pu
forward in "Vestiges of Creation",
& if the truth must be told,
there are some other works whi
have made more or less nois
in the world from their suppo
novelty, the elements, germs o
similitudes of which might
be easily pointed out in Darwi
And more than this: we hav
reason to suspect that some
who have said that They coul
to make him unpopular, hav
themselves sponged upon him
considerably for the materials o
their own reputation - So much
for literary consistency!

---

* Note. Still more recently & prominen
by Dr. Darwin's grandson Charles in his
celebrated work "Origin of Species."

Frontispiece V. III.

H. Fuseli Esq R.A. inv.t

J. Dadley sculp.t

The Temple of Nature.

London, Published May [illegible] by J. Johnson St Pauls Church Yard.

6058

THE

POETICAL WORKS

OF

ERASMUS DARWIN,

M.D. F.R.S.

CONTAINING THE BOTANIC GARDEN, IN TWO PARTS,
AND THE TEMPLE OF NATURE.

WITH

PHILOSOPHICAL NOTES AND PLATES.

IN THREE VOLUMES.

VOL. III.

CONTAINING THE TEMPLE OF NATURE.

LONDON:

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PREFACE.

THE Poem, which is here offered to the Public, does not pretend to inſtruct by deep reſearches of reaſoning; its aim is ſimply to amuſe by bringing diſtinctly to the imagination the beautiful and ſublime images of the operations of Nature in the order, as the Author believes, in which the progreſſive courſe of time preſented them.

The Deities of Egypt, and afterwards of Greece, and Rome, were derived from men famous in thoſe early times, as in the ages of hunting, paſturage, and agriculture. The hiſtories of ſome of their actions recorded in Scripture, or celebrated in the heathen mythology, are introduced, as the Author hopes, without impropriety into his account of thoſe remote periods of human ſociety.

In the Eleuſinian myſteries the philoſophy of the works of Nature, with the origin and progreſs of ſociety, are believed to have been taught by allegoric ſcenery explained by the Hierophant to the initiated, which gave riſe to the machinery of the following Poem.

PRIORY NEAR DERBY,
Jan. 1, 1802.

THE

TEMPLE OF NATURE.

ORIGIN OF SOCIETY.

CANTO I.

PRODUCTION OF LIFE.

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CANTO I.

PRODUCTION OF LIFE.

I. BY firm immutable immortal laws
Impreſs'd on Nature by the GREAT FIRST CAUSE,
Say, MUSE! how roſe from elemental ſtriſe
Organic forms, and kindled into life;
How Love and Sympathy with potent charm
Warm the cold heart, the lifted hand diſarm;
Allure with pleaſures, and alarm with pains,
And bind Society in golden chains.

Four paſt eventful Ages then recite,
And give the fifth, new-born of Time, to light;
The ſilken tiſſue of their joys diſcloſe,
Swell with deep chords the murmur of their woes;

Their laws, their labours, and their loves proclaim,
And chant their virtues to the trump of Fame.

IMMORTAL LOVE! who ere the morn of Time,
On wings outſtretch'd, o'er Chaos hung ſublime;
Warm'd into life the burſting egg of Night,
And gave young Nature to admiring Light!—
YOU! whoſe wide arms, in ſoft embraces hurl'd
Round the vaſt frame, connect the whirling world!
Whether immers'd in day, the Sun your throne,
You gird the planets in your ſilver zone;
Or warm, deſcending on ethereal wing,
The Earth's cold boſom with the beams of ſpring;
Preſs drop to drop, to atom atom bind,
Link ſex to ſex, or rivet mind to mind;
Attend my ſong!—With roſy lips rehearſe,
And with your poliſh'd arrows write my verſe!—
So ſhall my lines ſoft-rolling eyes engage,
And ſnow-white fingers turn the volant page;

The ſmiles of Beauty all my toils repay,
And youths and virgins chant the living lay.

II. WHERE EDEN'S sacred bowers triumphant ſprung,
By angels guarded, and by prophets ſung,
Wav'd o'er the eaſt in purple pride unfurl'd,
And rock'd the golden cradle of the World;

Cradle of the world, l. 36. The nations, which poſſeſs Europe and a part of Africa, appear to have deſcended from one family; and to have had their origin near the banks of the Mediterranean, as probably in Syria, the ſite of Paradiſe, according to the Moſaic hiſtory. This ſeems highly probable from the ſimilarity of the ſtructure of the languages of theſe nations, and from their early poſſeſſion of ſimilar religions, cuſtoms, and arts, as well as from the moſt ancient hiſtories extant. The two former of theſe may be collected from Lord Monboddo's learned work on the Origin of Language, and from Mr. Bryant's curious account of Ancient Mythology.

The uſe of iron tools, of the bow and arrow, of earthen veſſels to boil water in, of wheels for carriages, and the arts of cultivating wheat, of coagulating milk for cheeſe, and of ſpinning vegetable fibres for clothing, have been known in all European countries, as long as their hiſtories have exiſted; beſides the ſimilarity of the texture of their languages, and of many

Four ſparkling currents lav'd with wandering tides
Their velvet avenues, and flowery sides;
On ſun-bright lawns unclad the Graces stray'd,
And guiltleſs Cupids haunted every glade; 40
Till the fair Bride, forbidden ſhades among,
Heard unalarm'd the Tempter's ſerpent-tongue;
Eyed the ſweet fruit, the mandate diſobey'd,
And her fond Lord with ſweeter ſmiles betray'd.
Conſcious awhile with throbbing heart he ſtrove,
Spread his wide arms, and barter'd life for love!—

---

words in them; thus the word sack is ſaid to mean a bag in all of them, as σακκον in Greek, ſaccus in Latin, ſacco in Italian, ſac in French, and ſack in Engliſh and German.

Other families of mankind, nevertheleſs, appear to have ariſen in other parts of the habitable earth, as the language of the Chineſe is ſaid not to reſemble thoſe of this part of the world in any reſpect. And the inhabitants of the iſlands of the South-Sea had neither the uſe of iron tools, nor of the bow, nor of wheels, nor of ſpinning, nor had learned to coagulate milk, or to boil water, though the domeſtication of fire ſeems to have been the firſt great diſcovery that diſtinguiſhed mankind from the beſtial inhabitants of the foreſt.

Now rocks on rocks, in ſavage grandeur roll'd,
Steep above ſteep, the blaſted plains infold;
The incumbent crags eternal tempeſt ſhrouds,
And livid light'nings cleave the lambent clouds; 50
Round the firm baſe loud-howling whirlwinds blow,
And ſands in burning eddies dance below.

Hence, ye profane!—the warring winds exclude
Unhallow'd throngs, that preſs with footſtep rude;
But court the Muſe's train with milder ſkies,
And call with ſofter voice the good and wiſe.
—Charm'd at her touch the opening wall divides,
And rocks of cryſtal form the poliſh'd ſides;
Through the bright arch the Loves and Graces tread,
Innocuous thunders murmuring o'er their head; 60
Pair after pair, and tittering, as they paſs,
View their fair features in the walls of glaſs;
Leave with impatient step the circling bourn,
And hear behind the cloſing rocks return.

HERE, high in air, unconſcious of the ſtorm,
Thy temple, NATURE, rears it's myſtic form;
From earth to heav'n, unwrought by mortal toil,
Towers the vaſt fabric on the deſert ſoil;
O'er many a league the ponderous domes extend,
And deep in earth the ribbed vaults deſcend; 70
A thouſand jaſper ſteps with circling ſweep
Lead the ſlow votary up the winding ſteep;
Ten thouſand piers, now join'd and now aloof,
Bear on their branching arms the fretted roof.

Unnumber'd aiſles connect unnumber'd halls,
And ſacred ſymbols crowd the pictur'd walls;

Pictur'd walls. l. 76. The application of mankind, in the early ages of ſociety, to the imitative arts of painting, carving, ſtatuary, and the caſting of figures in metals, ſeems to have preceded the diſcovery of letters; and to have been uſed as a written language to convey intelligence to their diſtant friends, or to tranſmit to poſterity the hiſtory of themſelves, or of their diſcoveries. Hence the origin of the hieroglyphic figures which crowded the walls of the temples of antiquity; many of which may be ſeen in the tablet of Iſis in the works of Montfaucon;

With pencil rude forgotten days design,
And arts, or empires, live in every line.
While chain'd reluctant on the marble ground,
Indignant TIME reclines, by Sculpture bound; 80
And ſternly bending o'er a ſcroll unroll'd,
Inſcribes the future with his ſtyle of gold.
—So erst, when PROTEUS on the briny ſhore,
New forms aſſum'd of eagle, pard, or boar;
The wiſe ATRIDES bound in ſea-weed thongs
The changeful god amid his ſcaly throngs;
Till in deep tones his opening lips at laſt
Reluctant told the future and the paſt.

HERE o'er piazza'd courts, and long arcades,
The bowers of PLEASURE root their waving
ſhades; 90

---

and ſome of them are ſtill uſed in the ſciences of chemiſtry and aſtronomy, as the characters for the metals and planets, and the figures of animals on the celeſtial globe.

So erſt, when Proteus, l. 83. It ſeems probable that Proteus was the name of a hieroglyphic figure repreſenting Time; whoſe

Shed o'er the panſied moſs a checker'd gloom,
Bend with new fruits, with flow'rs ſucceſſive bloom.
Pleas'd, their light limbs on beds of roſes preſs'd,
In ſlight undreſs recumbent Beauties reſt;
On tiptoe ſteps ſurrounding Graces move,
And gay Deſires expand their wings above.

Here young Dione arms her quiver'd Loves,
Schools her bright Nymphs, and practiſes her doves;
Calls round her laughing eyes in playful turns,
The glance that lightens, and the ſmile that burns; 100
Her dimpling cheeks with tranſient bluſhes dies,
Heaves her white boſom with ſeductive ſighs;

---

form was perpetually changing, and who could diſcover the paſt events of the world, and predict the future. Herodotus does not doubt but that Proteus was an Egyptian king or deity; and Orpheus calls him the principle of all things, and the moſt ancient of the gods; and adds, that he keeps the keys of Nature, *Danet's Dict.* all which might well accord with a figure repreſenting Time.

Or moulds with roſy lips the magic words,
That bind the heart in adamantine cords.

Behind in twilight gloom with scowling mien
The demon Pain, convokes his court unſeen;
Whips, fetters, flames, pourtray'd on ſculptur'd ſtone,
In dread feſtoons, adorn his ebon throne;
Each ſide a cohort of diſeaſes ſtands,
And ſhuddering Fever leads the ghaſtly bands'; 110
O'er all Deſpair expands his raven wings,
And guilt-ſtain'd Conſcience darts a thouſand ſtings.

Deep-whelm'd beneath, in vaſt ſepulchral caves,
Oblivion dwells amid unlabell'd graves;
The ſtoried tomb, the laurell'd buſt o'erturns,
And ſhakes their aſhes from the mould'ring urns:—
No vernal zephyr breathes, no ſunbeams cheer,
Nor ſong, nor ſimper, ever enters here;
O'er the green floor, and round the dew-damp wall,
The ſlimy ſnail, and bloated lizard crawl; 120

While on white heaps of intermingled bones
The muſe of MELANCHOLY ſits and moans;
Showers her cold tears o'er Beauty's early wreck,
Spreads her pale arms, and bends her marble neck.

So in rude rocks, beſide the Ægean wave,
TROPHONIUS ſcoop'd his ſorrow-ſacred cave;
Unbarr'd to pilgrim feet the brazen door,
And the ſad ſage returning ſmil'd no more.

Trophonius ſcoop'd, l. 126. Plutarch mentions, that prophecies of evil events were uttered from the cave of Trophonius; but the allegorical ſtory, that whoever entered this cavern were never again ſeen to ſmile, ſeems to have been deſigned to warn the contemplative from conſidering too much the dark ſide of nature. Thus an ancient poet is ſaid to have written a poem on the miſeries of the world, and to have thence become ſo unhappy as to deſtroy himſelf. When we reflect on the perpetual deſtruction of organic life, we ſhould alſo recollect, that it is perpetually renewed in other forms by the ſame materials, and thus the ſum total of the happineſs of the world continues undiminiſhed; and that a philoſopher may thus ſmile again on turning his eyes from the coffins of nature to her cradles.

SHRIN'D in the midſt majeſtic NATURE ſtands,
Extends o'er earth and ſea her hundred hands; 130
Tower upon tower her beamy forehead creſts,
And births unnumbered milk her hundred breaſts;
Drawn round her brows a lucid veil depends,
O'er her fine waiſt the purfled woof deſcends;
Her ſtately limbs the gather'd folds ſurround,
And ſpread their golden ſelvage on the ground.

From this firſt altar fam'd ELEUSIS ſtole
Her ſecret ſymbols and her myſtic ſcroll;

Fam'd Eleuſis ſtole, l. 137. The Eleuſinian myſteries were invented in Egypt, and afterwards transferred into Greece along with moſt of the other early arts and religions of Europe. They ſeem to have conſiſted of ſcenical repreſentations of the philoſophy and religion of thoſe times, which had previouſly been painted in hieroglyphic figures to perpetuate them before the diſcovery of letters; and are well explained in Dr. Warburton's divine legation of Moſes; who believes with great probability, that Virgil in the ſixth book of the Æneid has deſcribed a part of theſe myſteries in his account of the Elyſian fields.

In the firſt part of this ſcenery was repreſented Death, and the deſtruction of all things; as mentioned in the note on the Portland

With pious fraud in after ages rear'd
Her gorgeous temple, and the gods rever'd. 140
—Firſt in dim pomp before the aſtoniſh'd throng,
Silence, and Night, and Chaos, ſtalk'd along;
Dread ſcenes of Death, in nodding ſables dreſs'd,
Froze the broad eye, and thrill'd the unbreathing breaſt.
Then the young Spring, with winged Zephyr, leads
The queen of Beauty to the bloſſom'd meads;
Charm'd in her train admiring Hymen moves,
And tiptoe Graces hand in hand with Loves.

Vaſe in the Botanic Garden. Next the marriage of Cupid and Pſyche ſeems to have ſhown the reproduction of living nature; and afterwards the proceſſion of torches, which is ſaid to have conſtituted a part of the myſteries, probably ſignified the return of light, and the reſuſcitation of all things.

Laſtly, the hiſtories of illuſtrious perſons of the early ages ſeem to have been enacted; who were firſt repreſented by hieroglyphic figures, and afterwards became the gods and goddeſſes of Egypt, Greece, and Rome. Might not ſuch a dignified pantomime be contrived, even in this age, as might ſtrike the ſpectators with awe, and at the ſame time explain many philoſophical truths by adapted imagery, and thus both amuſe and inſtruct?

Next, while on pauſing ſtep the maſked mimes
Enact the triumphs of forgotten times,
Conceal from vulgar throngs the myſtic truth,
Or charm with Wiſdom's lore the initiate youth;
Each ſhifting ſcene, ſome patriot hero trod,
Some ſainted beauty, or ſome ſaviour god.

III. Now roſe in purple pomp the breezy dawn,
And crimſon dew-drops trembled on the lawn;
Blaz'd high in air the temple's golden vanes,
And dancing ſhadows veer'd upon the plains.—
Long trains of virgins from the ſacred grove,
Pair after pair, in bright proceſſion move,
With flower-fill'd baſkets round the altar throng,
Or ſwing their cenſers, as they wind along.
The fair Urania leads the bluſhing bands,
Preſents their offerings with unſullied hands;
Pleas'd to their dazzled eyes in part unſhrouds
The goddeſs-form;—the reſt is hid in clouds.

"Prieſtess of Nature! while with pious awe
Thy votary bends, the myſtic veil withdraw;

Charm after charm, ſucceſſion bright, diſplay,
And give the Goddess to adoring day! 170
So kneeling realms ſhall own the Power divine,
And heaven and earth pour incenſe on her ſhrine.

"Oh grant the Muse with pauſing ſtep to preſs
Each ſun-bright avenue, and green receſs;
Led by thy hand ſurvey the trophied walls,
The ſtatued galleries, and the pictur'd halls;
Scan the proud pyramid, and arch ſublime,
Earth-canker'd urn, medallion green with time,

The ſtatued galleries, l. 176. The art of painting has appeared in the early ſtate of all societies before the invention of the alphabet. Thus when the Spaniſh adventurers, under Cortez, invaded America, intelligence of their debarkation and movements was daily tranſmitted to Montezuma, by drawings, which correſponded with the Egyptian hieroglyphics. The antiquity of ſtatuary appears from the Memnon and ſphinxes of Egypt; that of caſting figures in metals from the golden calf of Aaron; and that of carving in wood from the idols or houſehold gods, which Rachel ſtole from her father Laban, and hid beneath her garments as ſhe ſat upon the ſtraw. Gen. c. xxxi. v. 34.

Stern buſts of Gods, with helmed heroes mix'd,
And Beauty's radiant forms, that ſmile betwixt.

"Waked by thy voice, tranſmuted by thy wand,
Their lips ſhall open, and their arms expand;
The love-loſt lady, and the warrior ſlain,
Leap from their tombs, and ſigh or fight again.
—So when ill-fated Orpheus tuned to woe
His potent lyre, and ſought the realms below;
Charm'd into life unreal forms reſpir'd,
And liſt'ning ſhades the dulcet notes admir'd.—

"Love led the Sage through Death's tremendous porch,
Cheer'd with his ſmile, and lighted with his torch;—

Love led the Sage, l. 189. This deſcription is taken from the figures on the Barbarini, or Portland Vaſe, where Eros, or Divine Love, with his torch precedes the manes through the gates of Death, and reverting his ſmiling countenance invites him into the Elyſian fields.

Hell's triple Dog his playful jaws expands,
Fawns round the God, and licks his baby hands;
In wondering groups the ſhadowy nations throng,
And ſigh or ſimper, as he ſteps along;
Sad ſwains, and nymphs forlorn, on Lethe's brink,
Hug their paſt ſorrows, and refuſe to drink;
Night's dazzled Empreſs feels the golden flame
Play round her breaſt, and melt her frozen frame;
Charms with ſoft words, and sooths with amorous wiles,
Her iron-hearted Lord,—and Pluto ſmiles.—200
His trembling Bride the Bard triumphant led
From the pale manſions of the aſtoniſh'd dead;
Gave the fair phantom to admiring light,—
Ah, ſoon again to tread irremeable night!"

IV. Her ſnow-white arm, indulgent to my ſong,
Waves the fair Hierophant, and moves along.—

Fawns round the God, l. 192. This idea is copied from a painting of the deſcent of Orpheus, by a celebrated Parisian artiſt.

High plumes, that bending ſhade her amber hair,
Nod, as ſhe ſteps, their ſilver leaves in air;
Bright chains of pearl, with golden buckles brac'd,
Claſp her white neck, and zone her ſlender waiſt; 210
Thin folds of ſilk in ſoft meanders wind
Down her fine form, and undulate behind;
The purple border, on the pavement roll'd,
Swells in the gale, and ſpreads its fringe of gold.

"First, if you can, celeſtial Guide! diſcloſe
From what fair fountain mortal life aroſe,
Whence the fine nerve to move and feel aſſign'd,
Contractile fibre, and ethereal mind:

"How Love and Sympathy the boſom warm,
Allure with pleaſure, and with pain alarm, 220
With ſoft affections weave the ſocial plan,
And charm the liſtening Savage into Man."

“GOD THE FIRST CAUSE!—in this terrene abode
Young Nature liſps, ſhe is the child of GOD.

God the firſt cauſe, l. 223.

A Jove principium, musæ! Jovis omnia plena. VIRGIL.

In him we live, and move, and have our being. ST. PAUL.

Young Nature liſps, l. 224. The perpetual production and increaſe of the ſtrata of limeſtone from the ſhells of aquatic animals; and of all thoſe incumbent on them from the recrements of vegetables and of terreſtial animals, are now well underſtood from our improved knowledge of geology; and ſhow, that the ſolid parts of the globe are gradually enlarging, and conſequently that it is young; as the fluid parts are not yet all converted into ſolid ones. Add to this, that ſome parts of the earth and its inhabitants appear younger than others; thus the greater height of the mountains of America ſeems to ſhow that continent to be leſs ancient than Europe, Aſia, and Africa; as their ſummits have been leſs waſhed away, and the wild animals of America, as the tigers and crocodiles, are ſaid to be leſs perfect in reſpect to their ſize and ſtrength; which would ſhow them to be ſtill in a ſtate of infancy, or of progreſſive improvement. Laſtly the progreſs of mankind in arts and ſciences, which continues ſlowly to extend, and to increaſe, ſeems to evince the youth of human ſociety; whilſt the unchanging ſtate of the ſocieties of ſome inſects, as of the bee, waſp, and ant, which is uſually aſcribed to inſtinct, ſeems to evince the longer exiſtence, and greater matu-

From embryon births her changeful ſorms improve,
Grow, as they live, and ſtrengthen as they move.

" Ere Time began, from flaming Chaos hurl'd
Roſe the bright ſpheres, which form the circling world;
Earths from each ſun with quick exploſions burſt,
And ſecond planets iſſued from the firſt. 230
Then, whilſt the ſea at their coeval birth,
Surge over ſurge, involv'd the ſhoreleſs earth;
Nurs'd by warm ſun-beams in primeval caves
Organic Life began beneath the waves.

" First HEAT from chemic diſſolution ſprings,
And gives to matter its eccentric wings;

---

rity of thoſe ſocieties. The Juvenility of the earth ſhows that it has had a beginning or birth, and is a ſtrong natural argument evincing the exiſtence of a cauſe of its production, that is of the Deity.

Earths from each ſun, l. 229. See Botan. Garden, Vol. I. Cant. I. l. 107.

Firſt Heat from chemic, l. 235. The matter of heat is an ethereal fluid, in which all things are immerſed, and which

With ſtrong REPULSION parts the exploding maſs,
Melts into lymph, or kindles into gas.
ATTRACTION next, as earth or air ſubſides,
The ponderous atoms from the light divides, 240

conſtitutes the general power of repulſion; as appears in exploſions which are produced by the ſudden evolution of combined heat, and by the expanſion of all bodies by the ſlower diffuſion of it in its uncombined ſtate. Without heat all the matter of the world would be condenſed into a point by the power of attraction; and neither fluidity nor life could exiſt. There are alſo particular powers of repulſion, as thoſe of magnetiſm and electricity, and of chemiſtry, ſuch as oil and water; which laſt may be as numerous as the particular attractions which conſtitute chemical affinities; and may both of them exiſt as atmoſpheres round the individual particles of matter; ſee Botanic Garden, Vol. I. additional note VII. on elementary heat.

Attraction next, l 239. The power of attraction may be divided into general attraction, which is called gravity; and into particular attraction, which is termed chemical affinity. As nothing can act where it does not exiſt, the power of gravity muſt be conceived as extending from the ſun to the planets, occupying that immenſe ſpace; and may therefore be conſidered as an ethereal fluid, though not cognizable by our ſenſes like heat, light, and electricity.

Approaching parts with quick embrace combines,
Swells into ſpheres, and lengthens into lines.
Laſt, as fine goads the gluten-threads excite,
Cords grapple cords, and webs with webs unite;
And quick CONTRACTION with ethereal flame
Lights into life the fibre-woven frame.—

Particular attraction, or chemical affinity, muſt likewiſe occupy the ſpaces between the particles of matter which they cauſe to approach each other. The power of gravity may therefore be called the general attractive ether, and the matter of heat may be called the general repulſive ether; which conſtitute the two great agents in the changes of inanimate matter.

And quick Contraction, l. 245. The power of contraction which exiſts in organized bodies, and diſtinguiſhes life from inanimation, appears to conſiſt of an ethereal fluid which reſides in the brain and nerves of living bodies, and is expended in the act of ſhortening their fibres. The attractive and repulſive ethers require only the vicinity of bodies for the exertion of their activity, but the contractive ether requires at firſt the contact of a goad or ſtimulus, which appears to draw it off from the contracting fibre, and to excite the ſenſorial power of irritation. Theſe contractions of animal fibres are afterwards excited or repeated by the ſenſorial powers of ſenſation, volition, or aſſociation, as explained at large in Zoonomia, Vol. I.

Hence without parent by ſpontaneous birth
Riſe the firſt ſpecks of animated earth;
From Nature's womb the plant or inſect ſwims,
And buds or breathes, with microſcopic limbs. 250

"In earth, ſea, air, around, below, above,
Life's ſubtle woof in Nature's loom is wove;

There ſeems nothing more wonderful in the ether of contraction producing the ſhortening of a fibre, than in the ether of attraction cauſing two bodies to approach each other. The former indeed ſeems in ſome meaſure to reſemble the latter, as it probably occaſions the minute particles of the fibre to approach into abſolute or adheſive contact, by withdrawing from them their repulſive atmoſpheres; whereas the latter ſeems only to cauſe particles of matter to approach into what is popularly called contact, like the particles of fluids; but which are only in the vicinity of each other, and ſtill retain their repulſive atmoſpheres, as may be ſeen in riding through ſhallow water by the number of minute globules of it thrown up by the horſe's feet, which roll far on its ſurface; and by the difficulty with which ſmall globules of mercury poured on the ſurface of a quantity of it can be made to unite with it.

Spontaneous birth, l. 247. See additional Note, No. I.

Points glued to points a living line extends,
Touch'd by ſome goad approach the bending ends;
Rings join to rings, and irritated tubes
Claſp with young lips the nutrient globes or cubes;
And urged by appetencies new ſelect,
Imbibe, retain, digeſt, ſecrete, eject.
In branching cones the living web expands,
Lymphatic ducts, and convoluted glands; 260
Aortal tubes propel the naſcent blood,
And lengthening veins abſorb the refluent flood;

In branching cones, l. 259. The whole branch of an artery or vein may be conſidered as a cone, though each diſtinct diviſion of it is a cylinder. It is probable that the amount of the areas of all the ſmall branches from one trunk may equal that of the trunk otherwiſe the velocity of the blood would be greater in ſome parts than in others, which probably only exiſts when a part is compreſſed or inflamed.

Abſorb the refluent flood, l. 262. The force of the arterial impulſe appears to ceaſe, after having propelled the blood through the capillary veſſels; whence the venous circulation is owing to the extremities of the veins abſorbing the blood, as thoſe of the lymphatics abſorb the fluids. The great force of abſorption is well elucidated by Dr. Hales's experiment on the riſe of the ſap-juice in a vine-ſtump; ſee Zoonomia, Vol. I. Sect. XXIII.

Leaves, lungs, and gills, the vital ether breathe
On earth's green ſurface, or the waves beneath.
So Life's firſt powers arreſt the winds and floods,
To bones convert them, or to ſhells, or woods;
Stretch the vaſt beds of argil, lime, and ſand,
And from diminiſh'd oceans form the land!

" Next the long nerves unite their ſilver train,
And young SENSATION permeates the brain; 270

And from diminiſh'd oceans, l. 268. The increaſe of the ſolid parts of the globe by the recrements of organic bodies, as limeſtone rocks from ſhells and bones, and the beds of clay, marl, coals from decompoſed woods, is now well known to thoſe who have attended to modern geology; and Dr. Halley, and others, have endeavoured to ſhow, with great probability, that the ocean has decreaſed in quantity during the ſhort time which human hiſtory has exiſted. Whence it appears, that the exertions of vegetable and animal life convert the fluid parts of the globe into ſolid ones; which is probably effected by combining the matter of heat with the other elements, inſtead of ſuffering it to remain ſimply diffuſed amongſt them, which is a curious conjecture, and deſerves further inveſtigation.

And young Senſation, l. 270. Both ſenſation and volition conſiſt in an affection of the central part of the ſenſorium, or of

Through each new ſenſe the keen emotions dart,
Fluſh the young cheek, and ſwell the throbbing heart.
From pain and pleaſure quick VOLITIONS riſe,
Lift the ſtrong arm, or point the inquiring eyes;
With Reaſon's light bewilder'd Man direct,
And right and wrong with balance nice detect.
Laſt in thick ſwarms ASSOCIATIONS ſpring,
Thoughts join to thoughts, to motions motions cling;
Whence in long trains of catenation flow
Imagined joy, and voluntary woe. 280

"So, view'd through cryſtal ſpheres in drops ſaline,
Quick-ſhooting ſalts in chemic forms combine;
Or Mucor-ſtems, a vegetative tribe,
Spread their fine roots, the tremulous wave imbibe.

the whole of it; and hence cannot exiſt till the nerves are united in the brain. The motions of a limb of any animal cut from the body, are therefore owing to irritation, not to ſenſation or to volition. For the definitions of irritation, ſenſation, volition, and aſſociation, ſee additional Note II.

Or Mucor-ſtems, l. 283. Mucor or mould in its early ſtate is properly a microſcopic vegetable, and is ſpontaneouſly pro-

Next to our wondering eyes the focus brings
Self-moving lines, and animated rings;
Firſt Monas moves, an unconnected point,
Plays round the drop without a limb or joint;
Then Vibrio waves, with capillary eels,
And Vorticella whirls her living wheels; 290
While inſect Proteus ſports with changeful form
Through the bright tide, a globe, a cube, a worm.
Laſt o'er the field the Mite enormous ſwims,
Swells his red heart, and writhes his giant limbs.

V. "ORGANIC LIFE beneath the ſhoreleſs waves
Was born and nurs'd in Ocean's pearly caves;

duced on the ſcum of all decompoſing organic matter. The Monas is a moving ſpeck, the Vibrio is an undulating wire, the Proteus perpetually changes its ſhape, and the Vorticella has wheels about it's mouth, with which it makes an eddy, and is ſuppoſed thus to draw into its throat inviſible animalcules. Theſe names are from Linnæus and Muller; ſee Appendix to Additional Note I.

Beneath the ſhoreleſs waves, l. 295. The earth was originally covered with water, as appears from ſome of its higheſt mountains, conſiſting of ſhells cemented together by a ſolution of part

First forms minute, unſeen by ſpheric glaſs,
Move on the mud, or pierce the watery maſs;

of them, as the limeſtone rocks of the Alps; Ferber's Travels. It muſt be therefore concluded, that animal life began beneath the ſea.

Nor is this unanalogous to what ſtill occurs, as all quadrupeds and mankind in their embryon ſtate are aquatic animals; and thus may be ſaid to reſemble gnats and frogs. The fetus in the uterus has an organ called the placenta, the fine extremities of the veſſels of which permeate the arteries of the uterus, and the blood of the fetus becomes thus oxygenated from the paſſing ſtream of the maternal arterial blood; exactly as is done by the gills of fiſh from the ſtream of water, which they occaſion to paſs through them.

But the chicken in the egg poſſeſſes a kind of aerial reſpiration, ſince the extremities of its placental veſſels terminate on a membranous bag, which contains air, at the broad end of the egg; and in this the chick in the egg differs from the fetus in the womb, as there is in the egg no circulating maternal blood for the inſertion of the extremities of its reſpiratory veſſels, and in this alſo I ſuſpect that the eggs of birds differ from the ſpawn of fiſh; which latter is immerſed in water, and which has probably the extremities of its reſpiratory organ inſerted into the ſoft membrane which covers it, and is in contact with the water.

Firſt forms minute, l. 297. See Additional Note I. on Spontaneous Vitality.

These, as ſucceſſive generations bloom,
New powers acquire, and larger limbs aſſume;
Whence countleſs groups of vegetation ſpring,
And breathing realms of fin, and feet, and wing.

“ Thus the tall Oak, the giant of the wood,
Which bears Britannia's thunders on the flood;
The Whale, unmeaſured monſter of the main,
The lordly Lion, monarch of the plain,
The Eagle ſoaring in the realms of air,
Whoſe eye undazzled drinks the ſolar glare,
Imperious man, who rules the beſtial crowd,
Of language, reaſon, and reflection proud,
With brow erect who ſcorns this earthly ſod,
And ſtyles himſelf the image of his God;
Aroſe from rudiments of form and ſenſe,
An embryon point, or microſcopic ens!

An embryon point, l. 314. The arguments ſhowing that all vegetables and animals aroſe from ſuch a ſmall beginning, as a living point or living fibre, are detailed in Zoonomia, Sect. XXXIX. 4. 8. on Generation.

"Now in vaſt ſhoals beneath the brineleſs tide,
On earth's firm cruſt teſtaceous tribes reſide;
Age after age expands the peopled plain,
The tenants periſh, but their cells remain;
Whence coral walls and ſparry hills aſcend
From pole to pole, and round the line extend. 320

Next when impriſon'd fires in central caves
Burſt the firm earth, and drank the headlong waves;
And, as new airs with dread exploſion ſwell,
Form'd lava-iſles, and continents of ſhell;

Brineleſs tide, l. 315. As the ſalt of the ſea has been gradually accumulating, being waſhed down into it from the recrements of animal and vegetable bodies, the ſea muſt originally have been as freſh as river water: and as it is not ſaturated with ſalt, muſt become annually ſaline. The ſea water about our iſland contains at this time from about one twenty eighth to one thirtieth part of ſea ſalt, and about one eightieth of magneſian ſalt; Brownrigg on Salt.

Whence coral walls, l. 319. An account of the ſtructure of the earth is given in Botanic Garden, Vol. I. Additional Notes, XVI. XVIII. XIX. XX. XXIII. XXIV.

Drank the headlong waves, l. 322. See Additional Note III.

Pil'd rocks on rocks, on mountains mountains raiſed,
And high in heaven the firſt volcanoes blazed;
In countleſs ſwarms an inſect-myriad moves
From ſea-fan gardens, and from coral groves;

An inſect-myriad moves, l. 327. After iſlands or continents were raiſed above the primeval ocean, great numbers of the moſt ſimple animals would attempt to ſeek food at the edges or ſhores of the new land, and might thence gradually become amphibious; as is now ſeen in the frog, who changes from an aquatic animal to an amphibious one; and in the gnat, which changes from a natant to a volant ſtate.

At the ſame time new microſcopic animalcules would immediately commence wherever there was warmth and moiſture, and ſome organic matter, that might induce putridity. Thoſe ſituated on dry land, and immerſed in dry air, may gradually acquire new powers to preſerve their exiſtence; and by innumerable ſucceſſive reproductions for ſome thouſands, or perhaps millions of ages, may at length have produced many of the vegetable and animal inhabitants which now people the earth.

As innumerable ſhell-fiſh muſt have exiſted a long time beneath the ocean, before the calcareous mountains were produced and elevated; it is alſo probable, that many of the inſect tribes, or leſs complicate animals, exiſted long before the quadrupeds or more complicate ones, which in ſome meaſure accords

Leaves the cold caverns of the deep, and creeps
On ſhelving ſhores, or climbs on rocky ſteeps. 330
As in dry air the ſea-born ſtranger roves,
Each muſcle quickens, and each ſenſe improves;
Cold gills aquatic form reſpiring lungs,
And ſounds aerial flow from ſlimy tongues.

"So Trapa rooted in pellucid tides,
In countleſs threads her breathing leaves divides,

with the theory of Linnæus in reſpect to the vegetable world; who thinks, that all the plants now extant aroſe from the conjunction and reproduction of about ſixty different vegetables, from which he conſtitutes his natural orders.

As the blood of animals in the air becomes more oxygenated in their lungs, than that of animals in water by their gills; it becomes of a more ſcarlet colour, and from its greater ſtimulus the ſenſorium ſeems to produce quicker motions and finer ſenſations; and as water is a much better vehicle for vibrations or ſounds than air, the fiſh, even when dying in pain, are mute in the atmoſphere, though it is probable that in the water they may utter ſounds to be heard at a conſiderable diſtance. See on this ſubject, Botanic Garden, Vol. I. Canto IV. l. 176, Note.

So Trapa rooted, l. 335. The lower leaves of this plant grow

Waves her bright treſſes in the watery maſs,
And drinks with gelid gills the vital gas;
Then broader leaves in ſhadowy files advance,
Spread o'er the cryſtal flood their green expanſe; 340

under water, and are divided into minute capillary ramifications; while the upper leaves are broad and round, and have air bladders in their footſtalks to ſupport them above the ſurface of the water. As the aerial leaves of vegetables do the office of lungs, by expoſing a large ſurface of veſſels with their contained fluids to the influence of the air; ſo theſe aquatic leaves anſwer a ſimilar purpoſe like the gills of fiſh, and perhaps gain from water a ſimilar material. As the material thus neceſſary to life ſeems to be more eaſily acquired from air than from water, the ſubaquatic leaves of this plant and of ſiſymbrium, oenanthe, ranunculus aquatilis, water crow-foot, and ſome others, are cut into fine diviſions to increaſe the ſurface, whilſt thoſe above water are undivided; ſee Botanic Garden, Vol. II. Canto IV. l. 204, Note.

Few of the water plants of this country are uſed for economical purpoſes, but the ranunculus fluviatilis may be worth cultivation; as on the borders of the river Avon, near Ringwood, the cottagers cut this plant every morning in boats, almoſt all the year round, to feed their cows, which appear in good condition, and give a due quantity of milk; ſee a paper from Dr. Pultney in the Tranſactions of the Linnean Society, Vol. V.

And, as in air the adherent dew exhales,
Court the warm ſun, and breathe ethereal gales.

"So ſtill the Tadpole cleaves the watery vale
With balanc'd fins, and undulating tail;

So ſtill the Tadpole, l. 343. The transformation of the tadpole from an aquatic animal into an aerial one is abundantly curious. When firſt it is hatched from the ſpawn by the warmth of the ſeaſon, it reſembles a fiſh; it afterwards puts forth legs, and reſembles a lizard; and finally loſing its tail, and acquiring lungs inſtead of gills, becomes an aerial quadruped.

The rana temporaria of Linnæus lives in the water in ſpring, and on the land in ſummer, and catches flies. Of the rana paradoxa the larva or tadpole is as large as the frog, and dwells in Surinam, whence the miſtake of Merian and of Seba, who call it a frog fiſh. The eſculent frog is green, with three yellow lines from the mouth to the anus; the back tranſverſely gibbous, the hinder feet palmated; its more frequent croaking in the evenings is ſaid to foretell rain. Linnei Syſt. Nat. Art. rana.

Linnæus aſſerts in his introduction to the claſs Amphibia, that frogs are ſo nearly allied to lizards, lizards to ſerpents, and ſerpents to fiſh, that the boundaries of theſe orders can ſcarcely be aſcertained.

New lungs and limbs proclaim his ſecond birth,
Breathe the dry air, and bound upon the earth.
So from deep lakes the dread Muſquito ſprings,
Drinks the ſoft breeze, and dries his tender wings,
In twinkling ſquadrons cuts his airy way,
Dips his red trunk in blood, and man his prey. 350

" So ſtill the Diodons, amphibious tribe,
With two-fold lungs the ſea or air imbibe;
Allied to fiſh, the lizard cleaves the flood
With one-cell'd heart, and dark frigeſcent blood;
Half-reaſoning Beavers long-unbreathing dart
Through Eries's waves with perforated heart;
With gills and lungs reſpiring Lampreys ſteer,
Kiſs the rude rocks, and ſuck till they adhere;
The lazy Remora's inhaling lips,
Hung on the keel, retard the ſtruggling ſhips; 360

The dread Muſquito ſprings. l. 347. See Additional Note IV.

So ſtill the Diodon, l. 351. See Additional Note V.

With gills pulmonic breathes the enormous Whale,
And ſpouts aquatic columns to the gale;
Sports on the ſhining wave at noontide hours,
And ſhifting rainbows creſt the riſing ſhowers.

"So erſt, ere roſe the ſcience to record
In letter'd ſyllables the volant word;
Whence chemic arts, diſcloſed in pictured lines,
Liv'd to mankind by hieroglyphic ſigns;
And cluſtering ſtars, pourtray'd on mimic ſpheres,
Aſſumed the forms of lions, bulls, and bears; 370
—So erſt, as Egypt's rude deſigns explain,
Roſe young DIONE from the ſhoreleſs main;

At noontide hours, l. 363. The rainbows in our latitude are only ſeen in the mornings or evenings, when the ſun is not much more than forty-two degrees high. In the more northern latitudes, where the meridian ſun is not more than forty-two degrees high, they are alſo viſible at noon.

As Egypt's rude deſigns, l. 371. See Additional Note VI.

Roſe young Dione, l. 372. The hieroglyphic figure of Venus riſing from the ſea ſupported on a ſhell by two tritons, as well as that of Hercules armed with a club, appear to be re-

Type of organic Nature! ſource of bliſs!
Emerging Beauty from the vaſt abyſs!
Sublime on Chaos borne, the Goddeſs ſtood,
And ſmiled enchantment on the troubled flood;
The warring elements to peace reſtored,
And young Reflection wondered and adored."

Now pauſed the Nymph,—The Muſe reſponſive cries,
Sweet admiration ſparkling in her eyes, 380

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mains of the moſt remote antiquity. As the former is devoid of grace, and of the pictorial art of deſign, as one half of the group exactly reſembles the other; and as that of Hercules is armed with a club, which was the firſt weapon.

The Venus ſeems to have repreſented the beauty of organic Nature riſing from the ſea, and afterwards became ſimply an emblem of ideal beauty; while the figure of Adonis was probably deſigned to repreſent the more abſtracted idea of life or animation. Some of theſe hieroglyphic deſigns ſeem to evince the profound inveſtigations in ſcience of the Egyptian philoſophers, and to have outlived all written language; and ſtill conſtitute the ſymbols, by which painters and poets give form and animation to abſtracted ideas, as to thoſe of ſtrength and beauty in the above inſtances.

" Drawn by your pencil, by your hand unfurl'd,
Bright ſhines the tablet of the dawning world;
Amazed the Sea's prolific depths I view,
And VENUS riſing from the waves in YOU!

" Still Nature's births encloſed in egg or ſeed
From the tall foreſt to the lowly weed,
Her beaux and beauties, butterflies and worms,
Riſe from aquatic to aerial forms.
Thus in the womb the naſcent infant laves
Its natant form in the circumfluent waves; 390
With perforated heart unbreathing ſwims,
Awakes and ſtretches all its recent limbs;
With gills placental ſeeks the arterial flood,
And drinks pure ether from its Mother's blood.

Awakes and ſtretches, l. 392. During the firſt ſix months of geſtation, the embryon probably ſleeps, as it ſeems to have no uſe for voluntary power; it then ſeems to awake, and to ſtretch its limbs, and change its poſture in ſome degree, which is termed quickening.

With gills placental, l. 393. The placenta adheres to any

Erewhile the landed Stranger burſts his way,
From the warm wave emerging into day;
Feels the chill blaſt, and piercing light, and tries
His tender lungs, and rolls his dazzled eyes;
Gives to the paſſing gale his curling hair,
And ſteps a dry inhabitant of air. 400

"Creative Nile, as taught in ancient ſong,
So charm'd to life his animated throng;
O'er his wide realms the ſlow-ſubſiding flood
Left the rich treaſures of organic mud;

ſide of the uterus in natural geſtation, or of any other cavity in extra-uterine geſtation; the extremities of its arteries and veins probably permeate the arteries of the mother, and abſorb from thence through their fine coats the oxygen of the mother's blood; hence when the placenta is withdrawn, the ſide of the uterus, where it adhered, bleeds; but not the extremities of its own veſſels.

His dazzled eyes. l. 398. Though the membrana pupillaris deſcribed by modern anatomiſts guards the tender retina from too much light; the young infant nevertheleſs ſeems to feel the preſence of it by its frequently moving its eyes, before it can diſtinguiſh common objects.

While with quick growth young Vegetation yields
Her bluſhing orchards, and her waving fields;
Pomona's hand repleniſh'd Plenty's horn,
And Ceres laugh'd amid her ſeas of corn.—
Bird, beaſt, and reptile, ſpring from ſudden birth,
Raiſe their new forms, half-animal, half-earth; 410
The roaring lion ſhakes his tawny mane,
His ſtruggling limbs ſtill rooted in the plain;
With flapping wings aſſurgent eagles toil
To rend their talons from the adheſive ſoil;
The impatient ſerpent lifts his creſted head,
And drags his train unfiniſh'd from the bed.—
As Warmth and Moiſture blend their magic ſpells,
And brood with mingling wings the ſlimy dells;

As Warmth and Moiſture, l. 417.

In eodem corpore ſæpe
Altera pars vivit; rudis eſt pars altera tellus.
Quippe ubi temperiem ſumpſēre humorque calorque,
Concipiunt; & ab his oriuntur, cuncta duobus.
Ovid. Met. l. 1. 430.

This ſtory from Ovid of the production of animals from the

Contractile earths in ſentient forms arrange,
And Life triumphant ſtays their chemic
change." 420

Then hand in hand along the waving glades
The virgin Siſters paſs beneath the ſhades;
Aſcend the winding ſteps with pauſing march,
And ſeek the Portico's ſuſurrant arch;
Whoſe ſculptur'd architrave on columns borne
Drinks the firſt bluſhes of the riſing morn,
Whoſe fretted roof an ample ſhield diſplays,
And guards the Beauties from meridian rays.
While on light ſtep enamour'd Zephyr ſprings,
And fans their glowing features with his wings, 430

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mud of the Nile ſeems to be of Egyptian origin, and is probably a poetical account of the opinions of the magi or prieſts of that country; ſhowing that the ſimpleſt animations were ſpontaneouſly produced like chemical combinations, but were diſtinguiſhed from the latter by their perpetual improvement by the power of reproduction, firſt by ſolitary, and then by ſexual generation; whereas the products of natural chemiſtry are only enlarged by accretion, or purified by filtration.

Imbibes the fragrance of the vernal flowers,
And ſpeeds with kiſſes ſweet the dancing Hours.

Urania, leaning with unſtudied grace,
Reſts her white elbow on a column's baſe;
Awhile reflecting takes her ſilent ſtand,
Her fair cheek preſs'd upon her lily hand;
Then, as awaking from ideal trance,
On the ſmooth floor her pauſing ſteps advance,
Waves high her arm, upturns her lucid eyes,
Marks the wide ſcenes of ocean, earth, and ſkies;
And leads, meandering as it rolls along
Through Nature's walks, the ſhining ſtream of Song.

Firſt her ſweet voice in plaintive accents chains
The Muſe's ear with facinating ſtrains;
Reverts awhile to elemental ſtrife,
The change of form, and brevity of life;

Then tells how potent Love with torch ſublime
Relights the glimmering lamp, and conquers Time.
—The poliſh'd walls reflect her roſy ſmiles,
And ſweet-ton'd echoes talk along the aiſles. 450

END OF CANTO I.

ORIGIN OF SOCIETY.

CANTO II.

REPRODUCTION OF LIFE.

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CANTO II.

REPRODUCTION OF LIFE.

I. "How ſhort the ſpan of LIFE! ſome hours
poſſeſs'd,
Warm but to cool, and active but to reſt!—
The age-worn fibres goaded to contract,
By repetition palſied, ceaſe to act;

How ſhort the ſpan of Life, l. 1. The thinking few in all ages have complained of the brevity of life, lamenting that mankind are not allowed time ſufficient to cultivate ſcience, or to improve their intellect. Hippocrates introduces his celebrated aphoriſms with this idea; "Life is ſhort, ſcience long, opportunities of knowledge rare, experiments fallacious, and reaſoning difficult."—A melancholy reflection to philoſophers!

The age-worn fibres, l. 3. Why the ſame kinds of food, which enlarge and invigorate the body from infancy to the meridian of life, and then nouriſh it for ſome years unimpaired, ſhould at length gradually ceaſe to do ſo, and the debility of age

When Time's cold hands the languid ſenſes ſeize,
Chill the dull nerves, the lingering currents freeze;
Organic matter, unreclaim'd by Life,
Reverts to elements by chemic ſtrife.
Thus Heat evolv'd from ſome fermenting maſs
Expands the kindling atoms into gas; 10
Which ſink ere long in cold concentric rings,
Condenſed, on Gravity's deſcending wings.

"But Reproduction with ethereal fires
New Life rekindles, ere the firſt expires;

and death ſupervene, would be liable to ſurpriſe us if we were not in the daily habit of obſerving it; and is a circumſtance which has not yet been well underſtood.

Before mankind introduced civil ſociety, old age did not exiſt in the world, nor other lingering diſeaſes; as all living creatures, as ſoon as they became too feeble to defend themſelves, were ſlain and eaten by others, except the young broods, who were defended by their mother; and hence the animal world exiſted uniformly in its greateſt ſtrength and perfection; ſee Additional Note VII.

But Reproduction, l. 13. See Additional Note VIII.

Calls up renaſcent Youth, ere tottering age
Quits the dull ſcene, and gives him to the ſtage;
Bids on his cheek the roſe of beauty blow,
And binds the wreaths of pleaſure round his brow;
With finer links the vital chain extends,
And the long line of Being never ends.

“ Self-moving Engines by unbending ſprings
May walk on earth, or flap their mimic wings;
In tubes of glaſs mercurial columns riſe,
Or ſink, obedient to the incumbent ſkies;
Or, as they touch the figured ſcale, repeat
The nice gradations of circumfluent heat.
But Reproduction, when the perfect Elf
Forms from fine glands another like itſelf,
Gives the true character of life and ſenſe,
And parts the organic from the chemic Ens.—

Unbending ſprings, l. 21. See Additional Note I. 4.

Where milder ſkies protect the naſcent brood,
And earth's warm boſom yields ſalubrious food;
Each new Deſcendant with ſuperior powers
Of ſenſe and motion ſpeeds the tranſient hours;
Braves every ſeaſon, tenants every clime,
And Nature riſes on the wings of Time.

"As Life diſcordant elements arreſts,
Rejects the noxious, and the pure digeſts;
Combines with Heat the fluctuating maſs,
And gives awhile ſolidity to gas; 40

Combines with Heat, l. 39. It was ſhown in note on line 248 of the firſt Canto, that much of the aerial and liquid parts of the terraqueous globe was converted by the powers of life into ſolid matter; and that this was effected by the combination of the fluid, heat, with other elementary bodies by the appetencies and propenſities of the parts of living matter to unite with each other. But when theſe appetencies and propenſities of the parts of organic matter to unite with each other ceaſe, the chemical affinities of attraction and the aptitude to be attracted, and of repulſion and the aptitude to be repelled, ſucceed, and reduce much of the ſolid matters back to the condition of elements; which ſeems to be effected by the matter of heat being again ſet

Organic forms with chemic changes ſtrive,
Live but to die, and die but to revive!
Immortal matter braves the tranſient ſtorm,
Mounts from the wreck, unchanging but in
form.—

" So, as the ſages of the Eaſt record
In ſacred ſymbol, or unletter'd word;

at liberty, which was combined with other matters by the powers of life; and thus by its diffuſion the ſolid bodies return into liquid ones or into gaſes, as occurs in the proceſſes of fermentation, putrefaction, ſublimation, and calcination. Whence ſolidity appears to be produced in conſequence of the diminution of heat, as the condenſation of ſteam into water, and the conſolidation of water into ice, or by the combination of heat with bodies, as with the materials of gun-powder before its exploſion.

Immortal matter, l. 43. The perpetual mutability of the forms of matter ſeems to have ſtruck the philoſophers of great antiquity; the ſyſtem of tranſmigration taught by Pythagoras, in which the ſouls of men were ſuppoſed after death to animate the bodies of a variety of animals, appears to have ariſen from this ſource. He had obſerved the perpetual changes of organic matter from one creature to another, and concluded, that the vivifying ſpirit muſt attend it.

Emblem of Life, to change eternal doom'd,
The beauteous form of fair Adonis bloom'd.—
On Syrian hills the graceful Hunter ſlain
Dyed with his guſhing blood the ſhuddering plain;
And, ſlow-deſcending to the Elyſian ſhade,
Awhile with Proserpine reluctant ſtray'd;
Soon from the yawning grave the burſting clay
Reſtor'd the Beauty to delighted day;

Emblem of Life, l. 47. The Egyptian figure of Venus riſing from the ſea ſeems to have repreſented the Beauty of organic Nature, which the philoſophers of that country, the magi, appear to have diſcovered to have been elevated by earthquakes from the primeval ocean. But the hieroglyphic figure of Adonis ſeems to have ſignified the ſpirit of animation or life, which was perpetually wooed or courted by organic matter, and which periſhed and revived alternately. Afterwards the fable of Adonis ſeems to have given origin to the firſt religion promiſing a reſurrection from the dead; whence his funeral and return to life were celebrated for many ages in Egypt and Syria, the ceremonies of which Ezekiel complains as idolatrous, accuſing the women of Iſrael of lamenting over Thammus; which St. Cyril interprets to be Adonis, in his Commentaries on Iſaiah; Danet's Diction.

Array'd in youth's reſucitated charms,
And young DIONE woo'd him to her arms.—
Pleaſed for a while the aſſurgent youth above
Relights the golden lamp of life and love;
Ah, ſoon again to leave the cheerful light,
And ſink alternate to the realms of night. 60

II. "HENCE ere Vitality, as time revolves,
Leaves the cold organ, and the maſs diſſolves;
The Reproductions of the living Ens
From ſires to ſons, unknown to ſex, commence.
New buds and bulbs the living fibre ſhoots
On lengthening branches, and protruding roots;
Or on the father's ſide from burſting glands
The adhering young its naſcent form expands;
In branching lines the parent-trunk adorns,
And parts ere long like plumage, hairs, or horns. 70

"So the lone Truffle, lodged beneath the earth,
Shoots from paternal roots the tuberous birth;

So the lone Truffle, l. 71. Lycoperdon tuber. This plant

No ſtamen-males aſcend, and breathe above,
No ſeed-born offspring lives by female love.
From each young tree, for future buds deſign'd,
Organic drops exſude beneath the rind;
While theſe with appetencies nice invite,
And thoſe with apt propenſities unite;
New embryon fibrils round the trunk combine
With quick embrace, and form the living line: 80
Whoſe plume and rootlet at their early birth
Seek the dry air, or pierce the humid earth.

" So ſafe in waves prolific Volvox dwells,
And five deſcendants crowd his lucid cells;

never riſes above the earth, is propagated without ſeed by its roots only, and ſeems to require no light. Perhaps many other fungi are generated without ſeed by their roots only, and without light, and approach on the laſt account to animal nature.

While theſe with appetencies, l. 77. See Additional Note VIII.

Prolific Volvox, l. 83. The volvox globator dwells in the lakes of Europe, is tranſparent, and bears within it children and grandchildren to the fifth generation; Syſt. Nat.

So the male Polypus parental ſwims,
And branching infants briſtle all his limbs.
So the lone Tænia, as he grows, prolongs
His flatten'd form with young adherent throngs;
Unknown to ſex the pregnant oyſter ſwells,
And coral-inſects build their radiate ſhells; 90

The male Polypus. l. 85. The Hydra viridis and fuſca of Linnæus dwell in our ditches and rivers under aquatic plants; theſe animals have been ſhown by ingenious obſervers to revive after having been dried, to be reſtored when mutilated, to be multiplied by dividing them, and propagated from portions of them, parts of different ones to unite, to be turned inſide outwards and yet live, and to be propagated by ſeeds, to produce bulbs, and vegetate by branches. Syſt. Nat.

The lone Tænia. l. 87. The tape-worm dwells in the inteſtines of animals, and grows old at one extremity, producing an infinite ſeries of young ones at the other; the ſeparate joints have been called Gourd-worms, each of which poſſeſſes a mouth of its own, and organs of digeſtion. Syſt. Nat.

The pregnant oyſter. l. 89. Oſtrea edulis dwells in the European oceans, frequent at the tables of the luxurious, a living repaſt! New-born oyſters ſwim ſwiftly by an undulating movement of fins thruſt out a little way from their ſhells. Syſt. Nat. But

Parturient Sires careſs their infant train,
And heaven-born STORGE weaves the ſocial chain;
Succeſſive births her tender cares combine,
And ſoft affections live along the line.

"On angel-wings the GODDESS FORM deſcends,
Round her fond broods her ſilver arms ſhe bends;

they do not afterwards change their place during their whole lives, and are capable of no other movement, but that of opening the ſhell a little way: whence Profeſſor Beckman obſerves, that their offspring is probably produced without maternal organs; and that thoſe, who ſpeak of male and female oyſters, muſt be miſtaken: Phil. Magaz. March 1800. It is alſo obſerved by H. I. le Beck, that on nice inſpection of the Pearl oyſters in the gulf of Manar, he could obſerve no diſtinction of ſexes. Nicholſon's Journal. April 1800.

And coral inſects. l. 90. The coral habitation of the Madrepora of Linnæus conſiſts of one or more ſtar-like cells; a congeries of which form rocks beneath the ſea; the animal which conſtructs it is termed Meduſa; and as it adheres to its calcareous cavity, and thence cannot travel to its neighbours, is probably without ſex. I obſerved great maſſes of the limeſtone in Shropſhire, which is brought to Newport, to conſiſt of the cells of theſe animals.

And heaven-born Storge. l. 92. See Additional Note IX.

White ſtreams of milk her tumid boſom ſwell,
And on her lips ambroſial kiſſes dwell.
Light joys on twinkling feet before her dance
With playful nod, and momentary glance; 100
Behind, attendant on the panſied plain,
Young PSYCHE treads with CUPID in her train.

III. "IN theſe lone births no tender mothers blend
Their genial powers to nouriſh or defend;
No nutrient ſtreams from Beauty's orbs improve
Theſe orphan babes of ſolitary love;
Birth after birth the line unchanging runs,
And fathers live tranſmitted in their ſons;
Each paſſing year beholds the unvarying kinds,
The ſame their manners, and the ſame their minds. 110
Till, as erelong ſucceſſive buds decay,
And inſect-ſhoals ſucceſſive paſs away,
Increaſing wants the pregnant parents vex
With the fond wiſh to form a ſofter ſex;

A ſofter ſex. l. 114. The firſt buds of trees raiſed from ſeed die annually, and are ſucceeded by new buds by ſolitary repro-

Whoſe milky rills with pure ambroſial food
Might charm and cheriſh their expected brood.
The potent wiſh in the productive hour
Calls to its aid Imagination's power,

duction; which are larger or more perfect for ſeveral ſucceſſive years, and then they produce ſexual flowers, which are ſucceeded by ſeminal reproduction. The ſame occurs in bulbous-rooted plants raiſed from ſeed; they die annually, and produce others rather more perfect than the parent for ſeveral years, and then produce ſexual flowers. The Aphis is in a ſimilar manner hatched from an egg in the vernal months, and produces a viviparous offſpring without ſexual intercourſe for nine or ten ſucceſſive generations; and then the progeny is both male and female, which cohabit, and from theſe new females are produced eggs, which endure the winter; the ſame proceſs probably occurs in many other inſects.

Imagination's power. l. 118. The manner in which the ſimilarity of the progeny to the parent, and the ſex of it, are produced by the power of imagination, is treated of in Zoonomia. Sect. 39. 6. 3. It is not to be underſtood, that the firſt living fibres, which are to form an animal, are produced by imagination with any ſimilarity of form to the future animal; but with appetencies or propenſities, which ſhall produce by accretion of parts the ſimilarity of form and feature, or of ſex, correſponding with the imagination of the father.

O'er embryon throngs with myſtic charm preſides,
And ſex from ſex the naſcent world divides, 120
With ſoft affections warms the callow trains,
And gives to laughing Love his nymphs and ſwains;

His nymphs and ſwains. l. 122. The arguments which have been adduced to ſhow, that mankind and quadrupeds were formerly in an hermaphrodite ſtate, are firſt deduced from the preſent exiſtence of breaſts and nipples in all the males; which latter ſwell on titillation like thoſe of the females, and which are ſaid to contain a milky fluid at their birth; and it is affirmed, that ſome men have given milk to their children in deſert countries, where the mother has periſhed; as the male pigeon is ſaid to give a kind of milk from his ſtomach along with the regurgitated food, to the young doves, as mentioned in Additional Note IX. on Storge.

Secondly, from the apparent progreſs of many animals to greater perfection, as in ſome inſects, as the flies with two wings, termed Diptera; which have rudiments of two other wings, called halteres, or poiſers; and in many flowers which have rudiments of new ſtamina, or filaments without anthers on them. See Botanic Garden, Vol. II. Curcuma, Note, and the Note on l. 204 of Canto I. of this work.

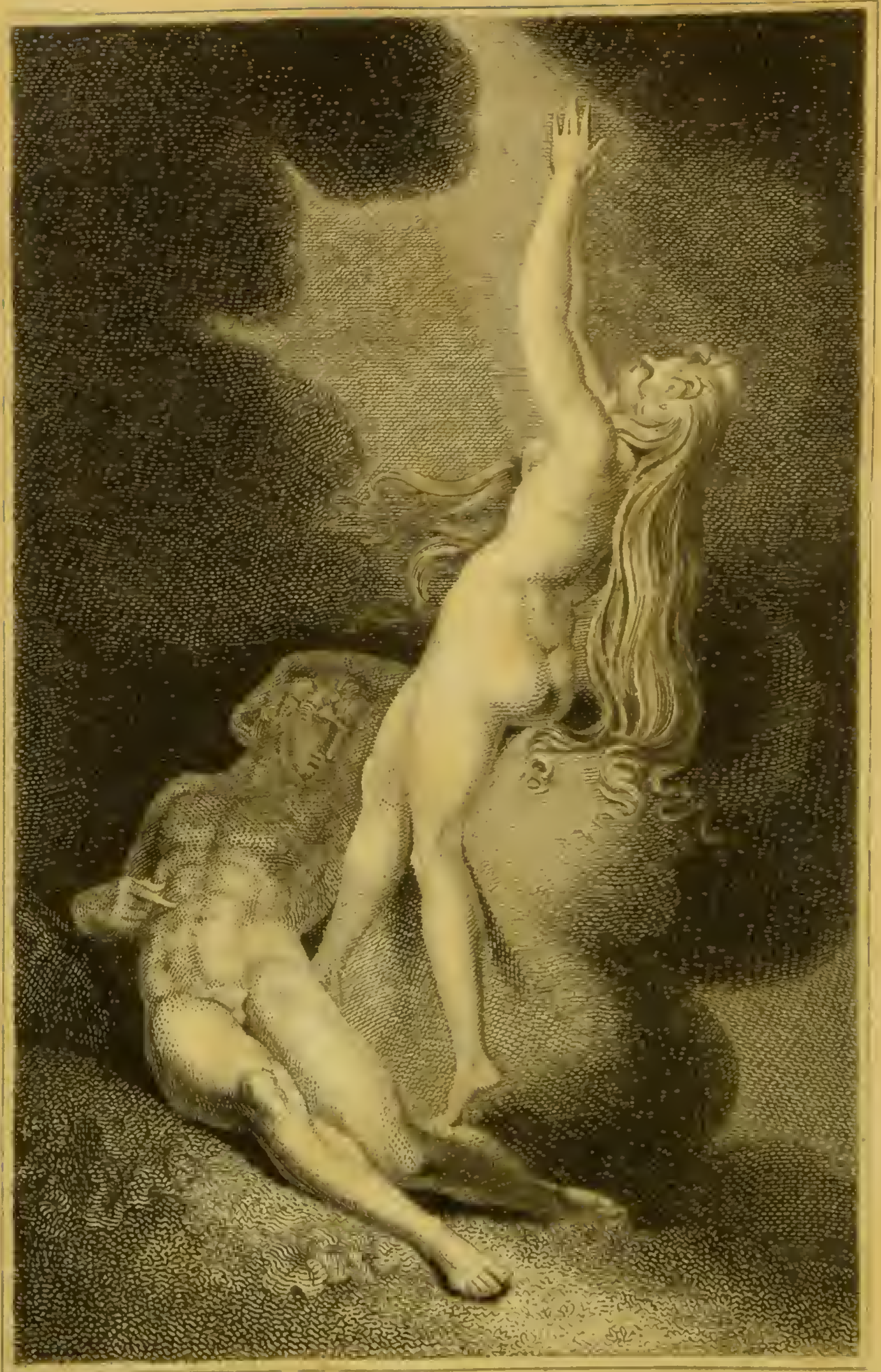
It has been ſuppoſed by ſome, that mankind were formerly quadrupeds as well as hermaphrodites; and that ſome parts of the body are not yet ſo convenient to an erect attitude as to a hori-

Whoſe mingling virtues interweave at length
The mother's beauty with the father's ſtrength.

"So tulip-bulbs emerging from the ſeed,
Year after year unknown to ſex proceed;
Erewhile the ſtamens and the ſtyles diſplay
Their petal-curtains, and adorn the day;

zontal one; as the fundus of the bladder in an erect poſture is not exactly over the inſertion of the urethra; whence it is ſeldom completely evacuated, and thus renders mankind more ſubject to the ſtone, than if he had preſerved his horizontality: theſe philoſophers, with Buffon and Helvetius, ſeem to imagine, that mankind aroſe from one family of monkeys on the banks of the Mediterranean; who accidentally had learned to uſe the adductor pollicis, or that ſtrong muſcle which conſtitutes the ball of the thumb, and draws the point of it to meet the points of the fingers; which common monkeys do not; and that this muſcle gradually increaſed in ſize, ſtrength, and activity, in ſucceſſive generations; and by this improved uſe of the ſenſe of touch, that monkeys acquired clear ideas, and gradually became men.

Perhaps all the productions of nature are in their progreſs to greater perfection! an idea countenanced by modern diſcoveries and deductions concerning the progreſſive formation of the ſolid parts of the terraqueous globe and conſonant to the dignity of the Creator of all things.



H Fuseli Esq' R.A inv'

J. Tadlo sculp'

The Creation of Eve.

The beaux and beauties in each bloſſom glow
With wedded joy, or amatorial woe. 130
Unmarried Aphides prolific prove
For nine ſucceſſions uninform'd of love;
New ſexes next with ſofter paſſions ſpring,
Breathe the fond vow, and woo with quivering wing.

"So erſt in Paradiſe creation's Lord,
As the firſt leaves of holy writ record,
From Adam's rib, who preſs'd the flowery grove,
And dreamt delighted of untaſted love,
To cheer and charm his ſolitary mind,
Form'd a new ſex, the Mother of Mankind. 140
—Buoy'd on light ſtep the Beauty ſeem'd to ſwim,
And ſtretch'd alternate every pliant limb;
Pleaſed on Euphrates' velvet margin ſtood,
And view'd her playful image in the flood;
Own'd the fine flame of love, as life began,
And ſmiled enchantment on adoring Man.

Down her white neck and o'er her boſom roll'd,
Flow'd in ſweet negligence her locks of gold;
Round her fine form the dim tranſparence play'd,
And ſhow'd the beauties, that it ſeem'd to ſhade. 150
—Enamour'd ADAM gaz'd with fond ſurpriſe,
And drank delicious paſſion from her eyes;
Felt the new thrill of young Deſire, and preſs'd
The graceful Virgin to his glowing breaſt.—
The conſcious Fair betrays her ſoft alarms,
Sinks with warm bluſh into his cloſing arms,
Yields to his fond careſs with wanton play,
And ſweet, reluctant, amorous, delay.

IV. "WHERE no new Sex with glands nutritious feeds,
Nurs'd in her womb, the ſolitary breeds; 160
No Mother's care their early ſteps directs,
Warms in her boſom, with her wings protects;

The clime unkind, or noxious food inſtills
To embryon nerves hereditary ills;
The feeble births acquired diſeaſes chaſe,
Till Death extinguiſh the degenerate race.

"So grafted trees with ſhadowy ſummits riſe,
Spread their fair bloſſoms, and perfume the ſkies;
Till canker taints the vegetable blood,
Mines round the bark, and feeds upon the wood.
So, years ſucceſſive, from perennial roots
The wire or bulb with leſſen'd vigour ſhoots;

Acquired diſeaſes. l. 165. See additional Note XI.

So grafted trees, l. 167. Mr. Knight firſt obſerved that thoſe apple and pear trees, which had been propagated for above a century by ingraftment were now ſo unhealthy, as not to be worth cultivation. I have ſuſpected the diſeaſes of potatoes attended with the curled leaf, and of ſtrawberry plants attended with barren flowers, to be owing to their having been too long raiſed from roots, or by ſolitary reproduction, and not from ſeeds, or ſexual reproduction, and to have thence acquired thoſe hereditary diſeaſes.

Till curled leaves, or barren flowers, betray
A waning lineage, verging to decay;
Or till, amended by connubial powers,
Riſe ſeedling progenies from ſexual flowers.

" E'en where unmix'd the breed, in ſexual tribes
Parental taints the naſcent babe imbibes,
Eternal war the Gout and Mania wage
With fierce uncheck'd hereditary rage; 180
Sad Beauty's form foul Scrofula ſurrounds
With bones diſtorted, and putreſcent wounds;
And, fell Conſumption! thy unerring dart
Wets its broad wing in Youth's reluctant heart.

" With pauſing ſtep, at night's refulgent noon,
Beneath the ſparkling ſtars, and lucid moon,
Plung'd in the ſhade of ſome religious tower,
The ſlow bell counting the departed hour,

And, fell Conſumption, l. 183.

.... Hæret lateri lethalis arundo. VIRGIL.

O'er gaping tombs were ſhed umbrageous Yews
On mouldering bones their cold unwholeſome
dews; 190
While low aerial voices whiſper round,
And moondrawn ſpectres dance upon the ground;
Poetic Melancholy loves to tread,
And bend in ſilence o'er the countleſs Dead;
Marks with loud ſobs infantine Sorrows rave,
And wring their pale hands o'er their Mother's
grave;
Hears on the new-turn'd ſod with geſtures wild
The kneeling Beauty call her buried child;
Upbraid with timorous accents Heaven's decrees,
And with ſad ſighs augment the paſſing breeze. 200
'Stern Time,' She cries, 'receives from Nature's
womb
Her beauteous births, and bears them to the tomb;
Calls all her ſons from earth's remoteſt bourn,
And from the cloſing portals none return!'

V. URANIA pauſed,—upturn'd her ſtreaming
eyes,
And her white boſom heaved with ſilent ſighs;
With her the MUSE laments the ſum of things,
And hides her ſorrows with her meeting wings;
Long o'er the wrecks of lovely Life they weep,
Then pleaſed reflect, " to die is but to ſleep;"
From Nature's coffins to her cradles turn,
Smile with young joy, with new affection burn.

And now the Muſe, with mortal woes impreſs'd,
Thus the fair Hierophant again addreſs'd:
—" Ah me! celeſtial Guide, thy words impart
Ills undeſerved, that rend the naſcent heart!
O, Goddeſs, ſay, if brighter ſcenes improve
Air-breathing tribes, and births of ſexual love?"—
The ſmiling Fair obeys the inquiring Muſe,
And in ſweet tones her grateful taſk purſues.

" Now on broad pinions from the realms above
Deſcending CUPID ſeeks the Cyprian grove;

To his wide arms enamour'd PSYCHE ſprings,
And claſps her lover with aurelian wings.
A purple ſaſh acroſs HIS ſhoulder bends,
And fringed with gold the quiver'd ſhafts ſuſpends;
The bending bow obeys the ſilken ſtring,
And, as he ſteps, the ſilver arrows ring.
Thin folds of gauze with dim tranſparence flow
O'er HER fair forehead, and her neck of ſnow; 230
The winding woof her graceful limbs ſurrounds,
Swells in the breeze, and ſweeps the velvet grounds;
As hand in hand along the flowery meads
His bluſhing bride the quiver'd hero leads;
Charm'd round their heads purſuing Zephyrs throng,
And ſcatter roſes, as they move along;

Enamoured Pſyché, l. 223. A butterfly was the ancient emblem of the ſoul after death as riſing from the tomb of its former ſtate, and becoming a winged inhabitant of air from an inſect creeping upon earth. At length the wings only were given to a beautiful nymph under the name of Pſyche, which is the Greek word for the ſoul, and alſo became afterwards to ſignify a butterfly, probably from the popularity of this allegory. Many

Bright beams of Spring in ſoft effuſion play,
And halcyon Hours invite them on their way.

"Delighted HYMEN hears their whiſper'd vows,
And binds his chaplets round their poliſh'd brows, 240
Guides to his altar, ties the flowery bands,
And as they kneel, unites their willing hands.
'Behold, he cries, Earth! Ocean! Air above,
'And hail the DEITIES OF SEXUAL LOVE!
'All forms of Life ſhall this fond Pair delight,
'And ſex to ſex the willing world unite;
'Shed their ſweet ſmiles in Earth's unſocial bowers,
'Fan with ſoft gales, and gild with brighter hours;
'Fill Pleaſure's chalice unalloy'd with pain,
'And give SOCIETY his golden chain.' 250

"Now young DESIRES, on purple pinions borne,
Mount the warm gales of Manhood's riſing morn;

allegorical deſigns of Cupid or Love warming a butterfly or the Soul with his torch may be ſeen in Spence's Polymetis, and a beautiful one of their marriage in Bryant's Mythology; from which this deſcription is in part taken.

With ſofter fires through virgin boſoms dart,
Fluſh the pale cheek, and goad the tender heart.
Ere the weak powers of tranſient Life decay,
And Heaven's ethereal image melts away;
LOVE with nice touch renews the organic frame,
Forms a young Ens, another and the ſame;
Gives from his roſy lips the vital breath,
And parries with his hand the ſhafts of death; 260
While BEAUTY broods with angel wings unfurl'd
O'er naſcent life, and ſaves the ſinking world.

"HENCE on green leaves the ſexual Pleaſures dwell,
And Loves and Beauties crowd the bloſſom's bell;
The wakeful Anther in his ſilken bed
O'er the pleaſed Stigma bows his waxen head;

While Beauty broods, l. 261.

Alma Venus! per te quoniam genus omne animantum
Concipitur, viſitque exortum lumina cœli. LUCRET.

With meeting lips and mingling ſmiles they ſup
Ambroſial dewdrops from the nectar'd cup;
Or buoy'd in air the plumy Lover ſprings,
And ſeeks his panting bride on Hymen-wings. 270

From the nectar'd cup, l. 268. The anthers and ſtigmas of flowers are probably nouriſhed by the honey, which is ſecreted by the honey-gland called by Linnæus the nectary; and poſſeſs greater ſenſibility or animation than other parts of the plant. The corol of the flower appears to be a reſpiratory organ belonging to theſe anthers and ſtigmas for the purpoſe of further oxygenating the vegetable blood for the production of the anther duſt and of this honey, which is alſo expoſed to the air in its receptacle or honey-cup; which, I ſuppoſe, to be neceſſary for its further oxygenation, as in many flowers ſo complicate an apparatus is formed for its protection from inſects, as in aconitum, delphinium, larkſpur, lonicera, woodbine; and becauſe the corol and nectary fall along with the anthers and ſtigmas, when the pericarp is impregnated.

Dr. B. S. Barton in the American Tranſactions has lately ſhown, that the honey collected from ſome plants is intoxicating and poiſonous to men, as from rhododendron, azalea, and datura; and from ſome other plants that it is hurtful to the bees which collect it; and that from ſome flowers it is ſo injurious or diſagreeable, that they do not collect it, as from the fritillaria or crown imperial of this country.

"The Stamen males, with appetencies juſt,
Produce a formative prolific duſt;
With apt propenſities, the Styles recluſe
Secrete a formative prolific juice;
Theſe in the pericarp erewhile arrive,
Ruſh to each other, and embrace alive.
—Form'd by new powers progreſſive parts ſucceed,
Join in one whole, and ſwell into a ſeed.

"So in fond ſwarms the living Anthers ſhine
Of bright Valliſner on the wavy Rhine; 280

With appetencies juſt, l. 271. As in the productions by chemical affinity one ſet of particles muſt poſſeſs the power of attraction, and the other the aptitude to be attracted, as when iron approaches a magnet; ſo when animal particles unite, whether in digeſtion or reproduction, ſome of them muſt poſſeſs an appetite to unite, and others a propenſity to be united. The former of theſe are ſecreted by the anthers from the vegetable blood, and the latter by the ſtyles or pericarp; ſee the Additional Note VIII. on Reproduction.

Of bright Valliſner, l. 280. Valliſneria, of the claſs of dioecia. The flowers of the male plant are produced under water, and as ſoon as their farina or duſt is mature, they detach

Break from their ſtems, and on the liquid glaſs
Surround the admiring ſtigmas as they paſs;
The love-ſick Beauties lift their eſſenced brows,
Sigh to the Cyprian queen their ſecret vows,
Like watchful Hero feel their ſoft alarms,
And claſp their floating lovers in their arms.

"Hence the male Ants their gauzy wings unfold,
And young Lampyris waves his plumes of gold;

themſelves from the plant, riſe to the ſurface and continue to flouriſh, and are wafted by the air or borne by the current to the female flowers. In this they reſemble thoſe tribes of inſects, where the males at certain ſeaſons acquire wings, but not the females, as ants, coccus, lampyris, phalæna, brumata, lichanella; Botanic Garden, Vol. II. Note on Valliſneria.

And young Lampyris, l. 288. The fire-fly is at ſome ſeaſons ſo luminous, that M. Merian ſays, that by putting two of them under a glaſs, ſhe was able to draw her figures of them by night. Whether the light of this and of other inſects be cauſed by their amatorial paſſion, and thus aſſiſts them to find each other; or is cauſed by reſpiration, which is ſo analogous to combuſtion; or to a tendency to putridity, as in dead fiſh and rotten wood, is ſtill to be inveſtigated; ſee Botanic Garden, Vol. I. Additional Note IX.

The Glow-Worm ſparkles with impaſſion'd light
On each green bank, and charms the eye of
night; 290
While new deſires the painted Snail perplex,
And twofold love unites the double ſex.

" Hence, when the Morus in Italia's lands
To ſpring's warm beam its timid leaf expands;
The Silk-Worm broods in countleſs tribes above
Crop the green treaſure, uninform'd of love;
Erewhile the changeful worm with circling head
Weaves the nice curtains of his ſilken bed;
Web within web involves his larva form,
Alike ſecured from ſunſhine and from ſtorm; 300
For twelve long days He dreams of bloſſom'd
groves,
Untaſted honey, and ideal loves;

Untaſted honey, l. 302. The numerous moths and butterflies ſeem to paſs from a reptile leaf-eating ſtate, and to acquire wings to flit in air, with a proboſcis to gain honey for their food along with their organs of reproduction, ſolely for the purpoſe of pro-

Wakes from his trance, alarm'd with young Deſire,
Finds his new ſex, and feels ecſtatic fire;
From flower to flower with honey'd lip he ſprings,
And ſeeks his velvet loves on ſilver wings.

VI. "The Demon, Jealouſy, with Gorgon frown
Blaſts the ſweet flowers of Pleaſure not his own,

pagating their ſpecies by ſexual intercourſe, as they die when that is completed. By the uſe of their wings they have acceſs to each other on different branches or on different vegetables, and by living upon honey probably acquire a higher degree of animation, and thus ſeem to reſemble the anthers of flowers, which probably are ſupported by honey only, and thence acquire greater ſenſibility; ſee Note on Valliſneria, l. 280 of this Canto.

A naturaliſt, who had ſtudied this ſubject, thought it not impoſſible that the firſt inſects were the anthers and ſtigmas of flowers, which had by ſome means looſened themſelves from their parent plant, like the male flowers of valliſneria, and that other inſects in proceſs of time had been formed from theſe, ſome acquiring wings, others fins, and others claws, from their ceaſeleſs efforts to procure food or to ſecure themſelves from injury. He contends, that none of theſe changes are more incomprehenſible than the transformation of caterpillars into butterflies; ſee Botanic Garden, Vol. I. Additional Note XXXIX.

Rolls his wild eyes, and through the ſhuddering grove
Purſues the ſteps of unſuſpecting Love; 310
Or drives o'er rattling plains his iron car,
Flings his red torch, and lights the flames of war.

"Here Cocks heroic burn with rival rage,
And Quails with Quails in doubtful fight engage;
Of armed heels and briſtling plumage proud,
They ſound the inſulting clarion ſhrill and loud,
With ruſtling pinions meet, and ſwelling cheſts,
And ſeize with cloſing beaks their bleeding creſts;
Riſe on quick wing above the ſtruggling foe,
And aim in air the death-devoting blow. 320
There the hoarſe ſtag his croaking rival ſcorns,
And butts and parries with his branching horns;

There the hoarſe ſtag, l. 321. A great want of one part of the animal world has conſiſted in the deſire of the excluſive poſſeſſion of the females; and theſe have acquired weapons to combat each other for this purpoſe, as the very thick ſhield-like horny ſkin on the ſhoulder of the boar is a defence only againſt animals of his own ſpecies, who ſtrike obliquely upwards, nor are

Contending Boars with tuſk enamell'd ſtrike,
And guard with ſhoulder-ſhield the blow oblique;
While female bands attend in mute ſurpriſe,
And view the victor with admiring eyes.—

"So Knight on Knight, recorded in romance,
Urged the proud ſteed, and couch'd the extended
lance;
He, whoſe dread proweſs with reſiſtleſs force,
O'erthrew the oppoſing warrior and his horſe, 330

his tuſks for other purpoſes, except to defend himſelf, as he is not naturally a carnivorous animal. So the horns of the ſtag are ſharp to offend his adverſary, but are branched for the purpoſe of parrying or receiving the thruſts of horns ſimilar to his own, and have therefore been formed for the purpoſe of combating other ſtags for the excluſive poſſeſſion of the females, who are obſerved, like the ladies in the times of chivalry, to attend the car of the victor.

The birds, which do not carry food to their young, and do not therefore marry, are armed with ſpurs for the purpoſe of fighting for the excluſive poſſeſſion of the females, as cocks and quails. It is certain that theſe weapons are not provided for their defence againſt other adverſaries, becauſe the females of theſe ſpecies are without this armour; Zoonomia, Sect. XXXIX. 4, 8.

Bleſs'd, as the golden guerdon of his toils,
Bow'd to the Beauty, and receiv'd her ſmiles.

" So when fair HELEN with ill-fated charms,
By PARIS wooed, provoked the world to arms,
Left her vindictive Lord to ſigh in vain
For broken vows, loſt love, and cold diſdain;
Fired at his wrongs, aſſociate to deſtroy
The realms unjuſt of proud adulterous Troy,
Unnumber'd Heroes braved the dubious fight,
And ſunk lamented to the ſhades of night. 340

" NOW vows connubial chain the plighted pair,
And join paternal with maternal care;
The married birds with nice ſelection cull
Soft thiſtle-down, gray moſs, and ſcattered wool,
Line the ſecluded neſt with feathery rings,
Meet with fond bills, and woo with fluttering wings.

Week after week, regardleſs of her food,
The incumbent Linnet warms her future brood;
Each ſpotted egg with ivory lips ſhe turns,
Day after day with fond expectance burns, 350
Hears the young priſoner chirping in his cell,
And breaks in hemiſpheres the obdurate ſhell.

The incumbent Linnet, l. 348. The affection of the unexperienced and untaught bird to its egg, which induces it to ſit days and weeks upon it to warm the encloſed embryon, is a matter of great difficulty to explain; See Additional Note IX. on Storge. Concerning the fabrication of their neſts, ſee Zoonomia, Sect. XVI. 13. on Inſtinct.

Hears the young priſoner, l. 351. The air-veſſel at the broad end of an incubated egg gradually extends its edges along the ſides of the ſhell, as the chick enlarges, but is at the ſame time applied cloſer to the internal ſurface of the ſhell: when the time of hatching approaches the chick is liable to break this air-bag with its beak, and thence begin to breathe and to chirp: at this time the edges of the enlarged air bag extend ſo as to cover internally one hemiſphere of the egg; and as one half of the external ſhell is thus moiſt and the other half dry, as ſoon as the mother hearing the chick chirp, or the chick itſelf wanting reſpirable air ſtrikes the egg, about its equatorial line, it breaks into two hemiſpheres, and liberates the priſoner.

Loud trills ſweet Philomel his tender ſtrain,
Charms his fond bride, and wakes his infant train;
Perch'd on the circling moſs, the liſtening throng
Wave their young wings, and whiſper to the ſong.

"The Lion-King forgets his ſavage pride,
And courts with playful paws his tawny bride;
The liſtening Tiger hears with kindling flame
The love-lorn night-call of his brinded dame. 360
Deſpotic Love diſſolves the beſtial war,
Bends their proud necks, and joins them to his car;
Shakes o'er the obedient pairs his ſilken thong,
And goads the humble, or reſtrains the ſtrong.—

And whiſper to the ſong. l. 356. A curious circumſtance is mentioned by Kircherus de Muſurgia, in his Chapter de Luſciniis. "That the young nightingales, that are hatched under other birds, never ſing till they are inſtructed by the company of other nightingales." And Johnſton affirms, that the nightingales that viſit Scotland, have not the ſame harmony as thoſe of Italy, (Pennant's Zoology, octavo, p. 255), which would lead us to ſuſpect, that the ſinging of birds, like human muſic, is an artificial language rather than a natural expreſſion of paſſion.

Slow roll the ſilver wheels,—in beauty's pride
Celeſtial PSYCHE bluſhing by his ſide.—
The lordly Bull behind and warrior Horſe
With voice of thunder ſhake the echoing courſe,
Chain'd to the car with herds domeſtic move,
And ſwell the triumph of deſpotic LOVE. 370

"Pleaſed as they paſs along the breezy ſhore
In twinkling ſhoals the ſcaly realms adore,
Move on quick fin with undulating train,
Or lift their ſlimy foreheads from the main.

With undulating train. l. 373. The ſide fins of fiſh ſeem to be chiefly uſed to poiſe them; as they turn upon their backs immediately when killed; the air-bladder aſſiſts them perhaps to riſe or deſcend by its poſſeſſing the power to condenſe the air in it by muſcular contraction; and it is poſſible, that at great depths in the ocean the air in this receptacle may by the great preſſure of the incumbent water become condenſed into ſo ſmall a ſpace, as to ceaſe to be uſeful to the animal, which was poſſibly the cauſe of the death of Mr. Day in his diving ſhip. See note on Ulva, Botan. Gard. V. II.

The progreſſive motion of fiſh beneath the water is produced principally by the undulation of their tails. One oblique plain of a

High o'er their heads on pinions broad diſplay'd
The feather'd nations ſhed a floating ſhade;

part of the tail on the right ſide of the fiſh ſtrikes the water at the ſame time that another oblique plain ſtrikes it on the left ſide, hence in reſpect to moving to the right or left theſe percuſſions of the water counteract each other, but they coincide in reſpect to the progreſſion of the fiſh; this power ſeems to be better applied to puſh forwards a body in water, than the oars of boats, as the particles of water recede from the ſtroke of the oar, whence the comparative power acquired is but as the difference of velocity between the ſtriking oar and the receding water. So a ſhip moves ſwifter with an oblique wind than with a wind of the ſame velocity exactly behind it: and the common windmill ſail placed obliquely to the wind is more powerful than one which directly recedes from it. Might not ſome machinery reſembling the tails of fiſh be placed behind a boat, ſo as to be moved with greater effect than common oars, by the force of wind or ſteam, or perhaps by hand?

On pinions broad diſplay'd. l. 375. The progreſſive motion of birds in the air is principally performed by the movement of their wings, and not by that of their tails as in fiſh. The bird is ſupported in an element ſo much lighter than itſelf by the reſiſtance of the air as it moves horizontally againſt the oblique plain made by its breaſt, expanded tail and wings, when

Pair after pair enamour'd ſhoot along,
And trill in air the gay impaſſion'd ſong.
With buſy hum in playful ſwarms around
Emerging inſects leave the peopled ground, 380
Riſe in dark clouds, and borne in airy rings
Sport round the car, and wave their golden wings.
Admiring Fauns purſue on dancing hoof,
And baſhful Dryads peep from ſhades aloof;
Emerging Nereids riſe from coral cells,
Enamour'd Tritons ſound their twiſted ſhells;

they are at reſt; the change of this obliquity alſo aſſiſts it to riſe, and even directs its deſcent, though this is owing principally to its ſpecific gravity, but it is in all ſituations kept upright or balanced by its wings.

As the ſupport of the bird in the air, as well as its progreſſion, is performed by the motion of the wings, theſe require ſtrong muſcles, as are ſeen on the breaſts of partridges. Whence all attempts of men to fly by wings applied to the weak muſcles of their arms have been ineffectual; but it is not certain whether light machinery ſo contrived as to be moved by their feet, might not enable them to fly a little way, though not ſo as to anſwer any uſeful purpoſe.

From ſparkling founts enchanted Naiads move,
And ſwell the triumph of deſpotic LOVE.

“ Delighted Flora, gazing from afar,
Greets with mute homage the triumphal car; 390
On ſilvery ſlippers ſteps with boſom bare,
Bends her white knee, and bows her auburn hair;
Calls to her purple heaths, and bluſhing bowers,
Burſts her green gems, and opens all her flowers;
O'er the bright Pair a ſhower of roſes ſheds,
And crowns with wreaths of hyacinth their heads.—
—Slow roll the ſilver wheels with ſnowdrops deck'd,
And primroſe bands the cedar ſpokes connect;
Round the fine pole the twiſting woodbine clings,
And knots of jaſmine claſp the bending ſprings; 400
Bright daiſy links the velvet harneſs chain,
And rings of violets join each ſilken rein;
Feſtoon'd behind, the ſnow-white lilies bend,
And tulip-taſſels on each ſide depend.

—Slow rolls the car,—the enamour'd Flowers exhale
Their treaſured ſweets, and whiſper to the gale;
Their ravelled buds, and wrinkled cups unfold,
Nod their green ſtems, and wave their bells of gold;
Breathe their ſoft ſighs from each enchanted grove,
And hail THE DEITIES OF SEXUAL LOVE. 410

"ONWARD with march ſublime in ſaffron robe
Young HYMEN ſteps, and traverſes the globe;
O'er burning ſands, and ſnow-clad mountains, treads,
Blue fields of air, and ocean's briny beds;
Flings from his radiant torch celeſtial light
O'er Day's wide concave, and illumes the Night.
With dulcet eloquence his tuneful tongue
Convokes and captivates the Fair and Young;
His golden lamp with ray ethereal dyes
The bluſhing cheek, and lights the laughing eyes; 420

With ſecret flames the virgin's boſom warms,
And lights the impatient bridegroom to her arms;
With lovely life all Nature's frame inſpires,
And, as they ſink, rekindles all her fires."

VII. Now pauſed the beauteous Teacher, and awhile
Gazed on her train with ſympathetic ſmile.
'Beware of Love! ſhe cried, ye Nymphs, and hear
'His twanging bowſtring with alarmed ear;
'Fly the firſt whiſper of the diſtant dart,
'Or ſhield with adamant the fluttering heart; 430
'To ſecret ſhades, ye Virgin trains, retire,
'And in your boſoms guard the veſtal fire.'
—The obedient Beauties hear her words, adviſed,
And bow with laugh repreſs'd, and ſmile chaſtiſed.

With laugh repreſs'd, l. 434. The cauſe of the violent actions of laughter, and of the difficulty of reſtraining them, is a curious ſubject of inquiry. When pain afflicts us, which we cannot avoid, we learn to relieve it by great voluntary exertions, as in grinning, holding the breath, or ſcreaming; now the plea-

Now at her nod the Nymph's attendant bring
Tranſlucent water from the bubbling ſpring;

ſurable ſenſation, which excites laughter, ariſes for a time ſo high as to change its name, and become a painful one; and we excite the convulſive motions of the reſpiratory muſcles to relieve this pain. We are however unwilling to loſe the pleaſure, and preſently put a ſtop to this exertion; and immediately the pleaſure recurs, and again as inſtantly riſes into pain. Which is further explained in Zoonomia, Sect. 34. 1. 4. When this pleaſurable ſenſation riſes into a painful one, and the cuſtoms of ſociety will not permit us to laugh aloud, ſome other violent voluntary exertion is uſed inſtead of it to alleviate the pain.

With ſmile chaſtiſed. l. 434. The origin of the ſmile has generally been aſcribed to inexplicable inſtinct, but may be deduced from our early aſſociations of actions and ideas. In the act of ſucking, the lips of the infant are cloſed round the nipple of its mother, till it has filled its ſtomach, and the pleaſure of digeſting this grateful food ſucceeds; then the ſphincter of the mouth, fatigued by the continued action of ſucking, is relaxed; and the antagoniſt muſcles of the face gently acting, produce the ſmile of pleaſure, which is thus during our lives aſſociated with gentle pleaſure, which is further explained in Zoonomia, Sect. 16. 8. 4.

In cryſtal cups the waves ſalubrious ſhine,
Unſtain'd untainted with immodeſt wine.
Next, where emerging from its ancient roots
Its widening boughs the Tree of Knowledge
ſhoots; 440
Pluck'd with nice choice before the Muſe they
placed
The now no longer interdicted taſte.
Awhile they ſit, from higher cares releaſed,
And pleaſed partake the intellectual feaſt.
Of good and ill they ſpoke, effect and cauſe,
Celeſtial agencies, and Nature's laws.

So when angelic Forms to Syria ſent
Sat in the cedar ſhade by ABRAHAM's tent;
A ſpacious bowl the admiring Patriarch fills
With dulcet water from the ſcanty rills; 450
Sweet fruits and kernels gathers from his hoard,
With milk and butter piles the plenteous board;
While on the heated hearth his Conſort bakes
Fine flour well kneaded in unleaven'd cakes.

The Gueſts ethereal quaff the lucid flood,
Smile on their hoſts, and taſte terreſtrial food;
And while from ſeraph-lips ſweet converſe ſprings,
Lave their fair feet, and cloſe their ſilver wings.

END OF CANTO II.

ORIGIN OF SOCIETY.

CANTO III.

PROGRESS OF THE MIND.

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CANTO III.

PROGRESS OF THE MIND.

I. Now roſe, adorn'd with Beauty's brighteſt hues,
The graceful HIEROPHANT, and winged MUSE;
Onward they ſtep around the ſtately piles,
O'er porcelain floors, through laqueated aiſles,
Eye Nature's lofty and her lowly ſeats,
Her gorgeous palaces, and green retreats,
Pervade her labyrinths with unerring tread,
And leave for future gueſts a guiding thread.

First with fond gaze blue fields of air they ſweep,
Or pierce the briny chambers of the deep; 10
Earth's burning line, and icy poles explore,
Her fertile ſurface, and her caves of ore;

Or mark how Oxygen with Azote-Gas
Plays round the globe in one aerial maſs,
Or fuſed with Hydrogen in ceaſeleſs flow
Forms the wide waves, which foam and roll below.

Next with illumined hands through priſms bright
Pleaſed they untwiſt the ſevenfold threads of light;
Or, bent in pencils by the lens, convey
To one bright point the ſilver hairs of Day. 20
Then mark how two electric ſtreams conſpire
To form the reſinous and vitreous fire;

How Oxygen, l. 13. The atmoſphere which ſurrounds us, is compoſed of twenty-ſeven parts of oxygen gas and ſeventy-three of azote or nitrogen gas, which are ſimply diffuſed together, but which, when combined, become nitrous acid. Water conſiſts of eighty-ſix parts oxygen, and fourteen parts of hydrogen or inflammable air, in a ſtate of combination. It is alſo probable, that much oxygen enters the compoſition of glaſs; as thoſe materials which promote vitrification, contain ſo much of it, as minium and mangaueſe; and that glaſs is hence a ſolid acid in the temperature of our atmoſphere, as water is a fluid one.

Two electric ſtreams, l. 21. It is the opinion of ſome phi-

Beneath the waves the fierce Gymnotus arm,
And give Torpedo his benumbing charm;
Or, through Galvanic chain-work as they paſs,
Convert the kindling water into gas.

How at the poles oppoſing Ethers dwell,
Attract the quivering needle, or repel.

loſophers, that the electric ether conſiſts of two kinds of fluids diffuſed together or combined; which are commonly known by the terms of poſitive and negative electricity, but are by theſe electricians called vitreous and reſinous electricity. The electric ſhocks given by the torpedo and by the gymnotus, are ſuppoſed to be ſimilar to thoſe of the Galvanic pile, as they are produced in water. Which water is decompoſed by the Galvanic pile and converted into oxygen and hydrogen gas; ſee Additional Note XII.

The magnetic ether may alſo be ſuppoſed to conſiſt of two fluids, one of which attracts the needle, and the other repels it; and, perhaps, chemial affinities, and gravitation itſelf, may conſiſt of two kinds of ether ſurrounding the particles of bodies, and may thence attract at one diſtance and repel at another; as appears when two inſulated electriſed balls are approached to each other, or when two ſmall globules of mercury are preſſed together.

How Gravitation by immortal laws
Surrounding matter to a centre draws;
How Heat, pervading oceans, airs, and lands,
With force uncheck'd the mighty maſs expands;
And laſt how born in elemental ſtriſe
Beam'd the firſt ſpark, and lighten'd into Liſe.

Now in ſweet tones the inquiring Muſe expreſs'd
Her ardent wiſh; and thus the Fair addreſs'd.
" Prieſteſs of Nature! whoſe exploring ſight
Pierces the realms of Chaos and of Night;
Of ſpace unmeaſured marks the firſt and laſt,
Of endleſs time the preſent, future, paſt;
Immortal Guide! O, now with accents kind
Give to my ear the progreſs of the Mind.
How loves, and taſtes, and ſympathies commence
From evaneſcent notices of ſenſe?
How from the yielding touch and rolling eyes
The piles immenſe of human ſcience riſe?—
With mind gigantic ſteps the puny Elf,
And weighs and meaſures all things but himſelf!"

The indulgent Beauty hears the grateful Muſe,
Smiles on her pupil, and her taſk renews. 50
Attentive Nymphs in ſparkling ſquadrons throng,
And choral Virgins liſten to the ſong;
Pleaſed Fauns and Naiads crowd in ſilent rings,
And hovering Cupids ſtretch their purple wings.

II. "FIRST the new actions of the excited ſenſe,
Urged by appulſes from without, commence;
With theſe exertions pain or pleaſure ſprings,
And forms perceptions of external things.
Thus, when illumined by the ſolar beams,
Yon waving woods, green lawns, and ſparkling ſtreams,
In one bright point by rays converging lie 61
Plann'd on the moving tablet of the eye;
The mind obeys the ſilver goads of light,
And IRRITATION moves the nerves of ſight.

And Irritation moves, l. 64. Irritation is an exertion or change of ſome extreme part of the ſenſorium reſiding in the muſcles

"Theſe acts repeated riſe from joys or pains,
And ſwell Imagination's flowing trains;
So in dread dreams amid the ſilent night
Grim ſpectre-forms the ſhuddering ſenſe affright;
Or Beauty's idol-image, as it moves,
Charms the cloſed eye with graces, ſmiles, and loves;
Each paſſing form the pauſing heart delights,
And young SENSATION every nerve excites.

or organs of ſenſe in conſequence of the appulſes of external bodies. The word perception includes both the action of the organ of ſenſe in conſequence of the impact of external objects and our attention to that action; that is, it expreſſes both the motion of the organ of ſenſe, or idea, and the pain or pleaſure that ſucceeds or accompanies it. Irritative ideas are thoſe which are preceded by irritation, which is excited by objects external to the organs of ſenſe: as the idea of that tree, which either I attend to, or which I ſhun in walking near it without attention. In the former caſe it is termed perception, in the latter it is termed ſimply an irritative idea.

And young Senſation, l. 72. Senſation is an exertion or change of the central parts of the ſenſorium or of the whole of it, *beginning* at ſome of thoſe extreme parts of it which reſide in the

"Oft from ſenſation quick VOLITION ſprings,
When pleaſure thrills us, or when anguiſh ſtings;
Hence Recollection calls with voice ſublime
Immerſed ideas from the wrecks of Time,
With potent charm in lucid trains diſplays
Eventful ſtories of forgotten days.
Hence Reaſon's efforts good with ill contraſt,
Compare the preſent, future, and the paſt; 80

muſcles or organs of ſenſe. Senſitive ideas are thoſe which are preceded by the ſenſation of pleaſure or pain, are termed Imagination, and conſtitute our dreams and reveries.

Quick Volition ſprings, l. 73. Volition is an exertion or change of the central parts of the ſenſorium, or of the whole of it *terminating* in ſome of thoſe extreme parts of it which reſide in the muſcles and organs of ſenſe. The vulgar uſe of the word *memory* is too unlimited for our purpoſe: thoſe ideas which we voluntarily recall are here termed ideas of *recollection*, as when we will to repeat the alphabet backwards. And thoſe ideas which are ſuggeſted to us by preceding ideas are here termed ideas of *ſuggeſtion*, as whilſt we repeat the alphabet in the uſual order; when by habits previouſly acquired B is ſuggeſted by A, and C by B, without any effort of deliberation. Reaſoning is that operation of the ſenſorium by which we excite two or many tribes of ideas, and then reexcite the ideas in which they differ

Each paſſing moment, unobſerved reſtrain
The wild diſcordancies of Fancy's train;
But leave uncheck'd the Night's ideal ſtreams,
Or, ſacred Muſes! your meridian dreams.

"And laſt Suggeſtion's myſtic power deſcribes
Ideal hoſts arranged in trains or tribes.
So when the Nymph with volant finger rings
Her dulcet harp, and ſhakes the ſounding ſtrings;
As with ſoft voice ſhe trills the enamour'd ſong,
Succeſſive notes, unwill'd, the ſtrain prolong; 90

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or correſpond. If we determine this difference, it is called judgment; if we in vain endeavour to determine it, it is called doubting.

If we reexcite the ideas in which they differ, it is called diſtinguiſhing. If we reexcite thoſe in which they correſpond, it is called comparing.

Each paſſing moment, l. 81. During our waking hours, we perpetually compare the paſſing trains of our ideas with the known ſyſtem of nature, and reject thoſe which are incongruous with it; this is explained in Zoonomia, Sect. XVII. 3. 7. and is there termed Intuitive Analogy. When we ſleep, the faculty of voli-

The tranſient trains Association ſteers,
And ſweet vibrations charm the aſtoniſh'd ears.

"On rapid feet o'er hills, and plains, and rocks,
Speed the ſcared leveret and rapacious fox;
On rapid pinions cleave the fields above
The hawk deſcending, and eſcaping dove;
With nicer noſtril track the tainted ground
The hungry vulture, and the prowling hound;
Converge reflected light with nicer eye
The midnight owl, and microſcopic fly; 100
With finer ear purſue their nightly courſe
The liſtening lion, and the alarmed horſe.

tion ceaſes to act, and in conſequence the uncompared trains of ideas become incongruous and form the farrago of our dreams; in which we never experience any ſurpriſe, or ſenſe of novelty.

Aſſociation ſteers, l. 91. Aſſociation is an exertion or change of ſome extreme part of the ſenſorium reſiding in the muſcles and organs of ſenſe in conſequence of ſome antecedent or attendant fibrous contractions. Aſſociate ideas, therefore, are thoſe which are preceded by other ideas or muſcular motions, without the intervention of irritation, ſenſation, or volition between them; theſe are alſo termed ideas of ſuggeſtion.

"The branching forehead with diverging horns
Creſts the bold bull, the jealous ſtag adorns;
Fierce rival boars with ſide-long fury wield
The pointed tuſk, and guard with ſhoulder-ſhield;
Bounds the dread tiger o'er the affrighted heath
Arm'd with ſharp talons, and reſiſtleſs teeth;
The pouncing eagle bears in clinched claws
The ſtruggling lamb, and rends with ivory jaws; 110
The tropic eel, electric in his ire,
Alarms the waves with unextinguiſh'd fire;
The fly of night illumes his airy way,
And ſeeks with lucid lamp his ſleeping prey;
Fierce on his foe the poiſoning ſerpent ſprings,
And inſects armies dart their venom'd ſtings.

The branching forehead, l. 103. The peculiarities of the ſhapes of animals which diſtinguiſh them from each other, are enumerated in Zoonomia, Sect. XXXIX. 4. 8. on Generation, and are believed to have been gradually formed from ſimilar living fibres, and are varied by reproduction. Many of theſe parts of animals are there ſhown to have ariſen from their three great deſires, of luſt, hunger, and ſecurity.

The tropic eel, l. 111. Gymnotus electricus.

The fly of night, l. 113. Lampyris noctiluca. Fire-fly.

“ Proud Man alone in wailing weakneſs born,
No horns protect him, and no plumes adorn;
No finer powers of noſtril, ear, or eye,
Teach the young Reaſoner to purſue or fly.— 120
Nerved with fine touch above the beſtial throngs,
The hand, firſt gift of Heaven! to man belongs;
Untipt with claws the circling fingers cloſe,
With rival points the bending thumbs oppoſe,

The hand, firſt gift of Heaven, l. 122. The human ſpecies in ſome of their ſenſations are much inferior to animals, yet the accuracy of the ſenſe of touch, which they poſſeſs in ſo eminent a degree, gives them a great ſuperiority of underſtanding; as is well obſerved by the ingenious Mr. Buffon. The extremities of other animals terminate in horns, and hoofs, and claws, very unfit for the ſenſation of touch; whilſt the human hand is finely adapted to encompaſs its object with this organ of ſenſe. Thoſe animals who have clavicles or collar-bones, and thence uſe their fore-feet like hands, as cats, ſquirrels, monkeys, are more ingenious than other quadrupeds, except the elephant, who has a fine ſenſe at the extremity of his proboſcis; and many inſects from the poſſeſſing finer organs of touch have greater ingenuity, as ſpiders, bees, waſps.

Trace the nice lines of Form with ſenſe refined,
And clear ideas charm the thinking mind.
Whence the fine organs of the touch impart
Ideal figure, ſource of every art;
Time, motion, number, ſunſhine or the ſtorm,
But mark varieties in Nature's *form.* 130

Trace the nice lines of form, l. 125. When the idea of ſolidity is excited a part of the extenſive organ of touch is compreſſed by ſome external body, and this part of the ſenſorium ſo compreſſed exactly reſembles in figure the figure of the body that compreſſed it. Hence when we acquire the idea of ſolidity, we acquire at the ſame time the idea of figure; and this idea of figure, or motion of a part of the organ of touch, exactly reſembles in its figure the figure of the body that occaſions it: and thus exactly acquaints us with this property of the external world.

Now, as the whole univerſe with all its parts poſſeſſes a certain form or figure, if any part of it moves, that form or figure of the whole is varied. Hence as motion is no other than a perpetual variation of figure, our idea of motion is alſo a real reſemblance of the motion that produced it.

Hence ariſes the certainty of the mathematical ſciences, as they explain theſe properties of bodies, which are exactly reſembled by our ideas of them, whilſt we are obliged to collect almoſt all our

“ Slow could the tangent organ wander o'er
The rock-built mountain, and the winding ſhore ;
No apt ideas could the pigmy mite,
Or embryon emmet to the touch excite ;
But as each maſs the ſolar ray reflects,
The eye's clear glaſs the tranſient beams collects ;
Bends to their focal point the rays that ſwerve,
And paints the living image on the nerve.
So in ſome village-barn, or feſtive hall
The ſpheric lens illumes the whiten'd wall ; 140
O'er the bright field ſucceſſive figures fleet,
And motley ſhadows dance along the ſheet.—
Symbol of ſolid forms is colour'd light,
And the mute language of the touch is ſight.

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other knowledge from experiment ; that is, by obſerving the effects exerted by one body upon another.

The mute language of the touch, l. 144. Our eyes obſerve a difference of colour, or of ſhade, in the prominences and depreſſions of objects, and that thoſe ſhades uniformly vary when the ſenſe of touch obſerves any variation. Hence when the retina becomes ſtimulated by colours or ſhades of light in a certain form,

"HENCE in Life's portico ſtarts young Surpriſe
With ſtep retreating, and expanded eyes;
The virgin, Novelty, whoſe radiant train
Soars o'er the clouds, or ſinks beneath the main,

as in a circular ſpot, we know by experience that this is a ſign that a tangible body is before us; and that its figure is reſembled by the miniature figure of the part of the organ of viſion that is thus ſtimulated,

Here whilſt the ſtimulated part of the retina reſembles exactly the viſible figure of the whole in miniature, the various kinds of ſtimuli from different colours mark the viſible figures of the minuter parts; and by habit we inſtantly recall the tangible figures.

So that though our viſible ideas reſemble in miniature the outline of the figure of coloured bodies, in other reſpects they ſerve only as a language, which by acquired aſſociations introduce the tangible ideas of bodies. Hence it is, that this ſenſe is ſo readily deceived by the art of the painter to our amuſement and inſtruction. The reader will find much very curious knowledge on this ſubject in Biſhop Berkeley's Eſſay on Viſion, a work of great ingenuity.

Starts young Surpriſe, l. 145. Surpriſe is occaſioned by the ſudden interruption of the uſual trains of our ideas by any violent ſtimulus from external objects, as from the unexpected diſcharge of a piſtol, and hence does not exiſt in our dreams, becauſe our

With ſweetly-mutable ſeductive charms
Thrills the young ſenſe, the tender heart
alarms. 150

external ſenſes are cloſed or inirritable. The fetus in the womb muſt experience many ſenſations, as of reſiſtance, figure, fluidity, warmth, motion, reſt, exertion, taſte; and muſt conſequently poſſeſs trains both of waking and ſleeping ideas. Surpriſe muſt therefore be ſtrongly excited at its nativity, as thoſe trains of ideas muſt inſtantly be diſſevered by the ſudden and violent ſenſations occaſioned by the dry and cold atmoſphere, the hardneſs of external bodies, light, ſound, and odours; which are accompanied with pleaſure or pain according to their quantity or intenſity.

As ſome of theſe ſenſations become familiar by repetition, other objects not previouſly attended to preſent themſelves, and produce the idea of novelty, which is a leſs degree of ſurpriſe, and like that is not perceived in our dreams, though for another reaſon; becauſe in ſleep we poſſeſs no voluntary power to compare our trains of ideas with our previous knowledge of nature, and do not therefore perceive their difference by intuitive analogy from what uſually occurs.

As the novelty of our ideas is generally attended with pleaſurable ſenſation, from this ariſes Curioſity, or a deſire of examining a variety of objects, hoping to find novelty, and the pleaſure conſequent to this degree of ſurpriſe; ſee Additional Note VII. 3.

Then Curioſity with tracing hands
And meeting lips the lines of form demands,
Buoy'd on light ſtep, o'er ocean, earth, and ſky,
Rolls the bright mirror of her reſtleſs eye.
While in wild groups tumultuous Paſſions ſtand,
And Luſt and Hunger head the Motley band;
Then Love and Rage ſucceed, and Hope and Fear;
And nameleſs Vices cloſe the gloomy rear;
Or young Philanthropy with voice divine
Convokes the adoring Youth to Virtue's ſhrine; 160
Who with raiſed eye and pointing finger leads
To truths celeſtial, and immortal deeds.

And meeting lips, l. 152. Young children put ſmall bodies into their mouths, when they are ſatiated with food, as well as when they are hungry, not with deſign to taſte them, but uſe their lips as an organ of touch to diſtinguiſh the ſhape of them. Puppies, whoſe toes are terminated with nails, and who do not much uſe their fore-feet as hands, ſeem to have no other means of acquiring a knowledge of the forms of external bodies, and are therefore perpetually playing with things by taking them between their lips.

III. "As the pure language of the ſight commands
The clear ideas furniſh'd by the hands;
Beauty's fine forms attract our wondering eyes,
And ſoft alarms the pauſing heart ſurpriſe.
Warm from its cell the tender infant born
Feels the cold chill of Life's aerial morn;
Seeks with ſpread hands the boſoms velvet orbs,
With cloſing lips the milky fount abſorbs; 170
And, as compreſs'd the dulcet ſtreams diſtil,
Drinks warmth and fragrance from the living rill;
Eyes with mute rapture every waving line,
Prints with adoring kiſs the Paphian ſhrine,
And learns erelong, the perfect form confeſs'd,
IDEAL BEAUTY from its Mother's breaſt.

Seeks with ſpread hands, l. 169. Theſe eight beautiful lines are copied from Mr. Bilſborrow's Addreſs prefixed to Zoonomia, and are tranſlated from that work; Sect. XVI. 6.

Ideal Beauty, l. 176. Sentimental Love, as diſtinguiſhed from the animal paſſion of that name, with which it is frequently accompanied, conſiſts in the deſire or ſenſation of beholding, embracing, and ſaluting a beautiful object.

The characteriſtic of beauty therefore is that it is the object of

" Now on ſwift wheels deſcending like a ſtar
Alights young EROS from his radiant car;

love; and though many other objects are in common language called beautiful, yet they are only called ſo metaphorically, and ought to be termed agreeable. A Grecian temple may give us the pleaſurable idea of ſublimity, a Gothic temple may give us the pleaſurable idea of variety, and a modern houſe the pleaſurable idea of utility; muſic and poetry may inſpire our love by aſſociation of ideas; but none of theſe, except metaphorically, can be termed beautiful, as we have no wiſh to embrace or ſalute them.

Our perception of beauty conſiſts in our recognition by the ſenſe of viſion of thoſe objects, firſt, which have before inſpired our love by the pleaſure, which they have afforded to many of our ſenſes; as to our ſenſe of warmth, of touch, of ſmell, of taſte, hunger and thirſt; and, ſecondly, which bear any analogy of form to ſuch objects.

Alights young Eros, l. 178. There were two deities of Love belonging to the heathen mythology, the one ſaid to be celeſtial, and the other terreſtrial. Ariſtophanes ſays, "Sable-winged Night produced an egg, from which ſprung up like a bloſſom Eros, the lovely, the deſirable, with his gloſſy golden wings." See Botanic Garden, Canto I. l. 412. Note. The other deity of Love, Cupido, ſeems of much later date, as he is not mentioned in the works of Homer, where there were ſo many apt ſituations to have introduced him.

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Parker sculp

Eros and Dione.

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On angel-wings attendant Graces move,
And hail the God of Sentimental Love. 180
Earth at his feet extends her flowery bed,
And bends her ſilver bloſſoms round his head;
Dark clouds diſſolve, the warring winds ſubſide,
And ſmiling ocean calms his toſſing tide,
O'er the bright morn meridian luſtres play,
And Heaven ſalutes him with a flood of day.

" Warm as the ſun-beam, pure as driven ſnows,
The enamour'd God for young Dione glows;
Drops the ſtill tear, with ſweet attention ſighs,
And woos the Goddeſs with adoring eyes; 190
Marks her white neck beneath the gauze's fold,
Her ivory ſhoulders, and her locks of gold;
Drinks with mute ecſtacy the tranſient glow,
Which warms and tints her boſom's riſing ſnow.

Earth at his feet, l. 181.

Te, Dea, te fugiunt venti, te nubila cœli,
Adventumque tuum; tibi ſuaves dædala tellus
Submittit flores; tibi rident æquora ponti;
Placatumque nitet diffuſo lumine cœlum. Lucret.

With holy kiſſes wanders o'er her charms,
And claſps the Beauty in Platonic arms;
Or if the dewy hands of Sleep, unbid,
O'er her blue eye-balls cloſe the lovely lid,
Watches each naſcent ſmile, and fleeting grace,
That plays in day-dreams o'er her bluſhing face;
Counts the fine mazes of the curls, that break
Round her fair ear, and ſhade her damaſk cheek;
Drinks the pure fragrance of her breath, and ſips
With tendereſt touch the roſes of her lips;—
O'er female hearts with chaſte ſeduction reigns,
And binds Society in ſilken chains.

IV. "If the wide eye the wavy lawns explores,
The bending woodlands, or the winding ſhores,

The wavy lawns, l. 207. When the babe, ſoon after it is born into this cold world, is applied to its mother's boſom, its ſenſe of perceiving warmth is firſt agreeably affected; next its ſenſe of ſmell is delighted with the odour of her milk; then its taſte is gratified by the flavour of it; afterwards the appetites of hunger and of thirſt afford pleaſure by the poſſeſſion of their objects, and by the ſubſequent digeſtion of the aliment; and laſtly,

Hills, whoſe green ſides with ſoft protuberance riſe,
Or the blue concave of the vaulted ſkies;— 210
Or ſcans with nicer gaze the pearly ſwell
Of ſpiral volutes round the twiſted ſhell;
Or undulating ſweep, whoſe graceful turns
Bound the ſmooth ſurface of Etrurian urns,

the ſenſe of touch is delighted by the ſoftneſs and ſmoothneſs of the milky fountain, the ſource of ſuch variety of happineſs.

All theſe various kinds of pleaſure at length become aſſociated with the form of the mother's breaſt; which the infant embraces with its hands, preſſes with its lips, and watches with its eyes; and thus acquires more accurate ideas of the form of its mother's boſom, than of the odour and flavour or warmth, which it perceives by its other ſenſes. And hence at our maturer years, when any object of viſion is preſented to us, which by its waving or ſpiral lines bears any ſimilitude to the form of the female boſom, whether it be found in a landſcape with ſoft gradations of riſing and deſcending ſurface, or in the forms of ſome antique vaſes, or in other works of the pencil or the chiſel, we feel a general glow of delight, which ſeems to influence all our ſenſes; and if the object be not too large, we experience an attraction to embrace it with our arms, and to ſalute it with our lips, as we did in our early infancy the boſom of our mother. And thus we find, according to the ingenious idea of Hogarth, that the waving lines of beauty were originally taken from the temple of Venus.

When on fine forms the waving lines impreſs'd
Give the nice curves, which ſwell the female breaſt;
The countleſs joys the tender Mother pours
Round the ſoft cradle of our infant hours,
In lively trains of unextinct delight
Riſe in our boſoms *recognized by ſight*; 220
Fond Fancy's eye recalls the form divine,
And TASTE ſits ſmiling upon Beauty's ſhrine.

"Where Egypt's pyramids gigantic ſtand,
And ſtretch their ſhadows o'er the ſhuddering ſand;
Or where high rocks o'er ocean's daſhing floods
Wave high in air their panoply of woods;
Admiring TASTE delights to ſtray beneath
With eye uplifted and forgets to breathe;
Or, as aloft his daring footſteps climb,
Creſts their high ſummits with his arm ſublime. 230

With his arm ſublime, l. 230. Objects of taſte have been generally divided into the beautiful, the ſublime, and the new; and lately to theſe have been added the pictureſque. The beautiful, ſo well explained in Hogarth's analyſis of beauty, conſiſts of curved lines and ſmooth ſurfaces, as expreſſed in the preceding

"Where mouldering columns mark the lingering wreck
Of Thebes, Palmyra, Babylon, Balbec;
The proſtrate obeliſk, or ſhatter'd dome,
Uprooted pedeſtal, and yawning tomb,
On loitering ſteps reflective TASTE ſurveys
With folded arms and ſympathetic gaze;
Charm'd with poetic Melancholy treads
O'er ruin'd towns and deſolated meads;

note; any object larger than uſual, as a very large temple or a very large mountain, gives us the idea of ſublimity; with which is often confounded the terrific, and the melancholic: what is now termed pictureſque includes objects, which are principally neither ſublime nor beautiful, but which by their variety and intricacy joined with a due degree of regularity or uniformity convey to the mind an agreeable ſentiment of novelty. Many other agreeable ſentiments may be excited by viſible objects, thus to the ſublime and beautiful may be added the terrific, tragic, melancholic, artleſs, &c. while novelty ſuperinduces a charm upon them all. See Additional Note XIII.

Poetic melancholy treads, l. 237. The pleaſure ariſing from the contemplation of the ruins of ancient grandeur or of ancient happineſs, and here termed poetic melancholy, ariſes from a combination of the painful idea of ſorrow with the pleaſurable idea of the grandeur or happineſs of paſt times; and becomes

Or rides ſublime on Time's expanded wings,
And views the fate of ever-changing things. 240

"When Beauty's ſtreaming eyes her woes expreſs,
Or Virtue braves unmerited diſtreſs;
Love ſighs in ſympathy, with pain combined,
And new-born Pity charms the kindred mind;
The enamour'd Sorrow every cheek bedews,
And Taste impaſſion'd woos the tragic Muſe.

very intereſting to us by fixing our attention more ſtrongly on that grandeur and happineſs, as the paſſion of Pity mentioned in the ſucceeding note is a combination of the painful idea of ſorrow with the pleaſurable one of beauty, or of virtue.

The tragic Muſe, l. 246. Why we are delighted with the ſcenical repreſentations of Tragedy, which draw tears from our eyes, has been variouſly explained by different writers. The ſame diſtreſsful circumſtance attending an ugly or wicked perſon affects us with grief or diſguſt; but when diſtreſs occurs to a beauteous or virtuous perſon, the pleaſurable idea of beauty or of virtue becomes mixed with the painful one of ſorrow and the paſſion of Pity is produced, which is a combination of love or eſteem with ſorrow; and becomes highly intereſting to us by fixing our attention more intenſely on the beauteous or virtuous perſon.

Other diſtreſsful ſcenes have been ſuppoſed to give pleaſure to the ſpectator from exciting a comparative idea of his own

"The ruſh-thatch'd cottage on the purple moor,
Where ruddy children frolic round the door,
The moſs-grown antlers of the aged oak,
The ſhaggy locks that fringe the colt unbroke, 250
The bearded goat with nimble eyes, that glare
Through the long tiſſue of his hoary hair;—
As with quick foot he climbs ſome ruin'd wall,
And crops the ivy, which prevents its fall;—
With rural charms the tranquil mind delight,
And form a picture to the admiring ſight.
While Taste with pleaſure bends his eye ſurpriſed
In modern days at Nature unchaſtiſed.

happineſs, as when a ſhipwreck is viewed by a perſon ſafe on ſhore, as mentioned by Lucretius, L. 3. But theſe dreadful ſituations belong rather to the terrible, or the horrid, than to the tragic; and may be objects of curioſity from their novelty, but not of Taſte, and muſt ſuggeſt much more pain than pleaſure.

Nature unchaſtiſed, l. 258. In cities or their vicinity, and even in the cultivated parts of the country, we rarely ſee undiſguiſed nature; the fields are ploughed, the meadows mown, the ſhrubs planted in rows for hedges, the trees deprived of their

"The Genius-Form, on ſilver ſlippers borne,
With fairer dew-drops gems the riſing morn;
Sheds o'er meridian ſkies a ſofter light,
And decks with brighter pearls the brow of night;
With finer bluſh the vernal bloſſom glows,
With ſweeter breath enamour'd Zephyr blows,
The limpid ſtreams with gentler murmurs paſs,
And gayer colours tinge the watery glaſs,
Charm'd round his ſteps along the enchanted groves
Flit the fine forms of Beauties, Graces, Loves.

V. "Alive, each moment of the tranſient hour,
When Reſt accumulates ſenſorial power,

lower branches, and the animals, as horſes, dogs, and ſheep, are mutilated in reſpect to their tails or ears; ſuch is the uſeful or ill-employed activity of mankind! all which alterations add to the formality of the ſoil, plants, trees, or animals; whence when natural objects are occaſionally preſented to us, as an uncultivated foreſt and its wild inhabitants, we are not only amuſed with greater variety of form, but are at the ſame time enchanted by the charm of novelty, which is a leſs degree of Surpriſe, already ſpoken of in note on l. 145 of this canto.

When Reſt accumulates, l. 270. The accumulation of the

The impatient Senſes, goaded to contract,
Forge new ideas, changing as they act;
And, in long ſtreams diſſever'd, or concrete
In countleſs tribes, the fleeting forms repeat.
Which riſe excited in Volition's trains,
Or link the ſparkling rings of Fancy's chains;

ſpirit of animation, when thoſe parts of the ſyſtem reſt, which are uſually in motion, produces a diſagreeable ſenſation. Whence the pain of cold and of hunger, and the irkſomeneſs of a continued attitude, and of an indolent life; and hence the propenſity to action in thoſe confined animals, which have been accuſtomed to activity, as is ſeen in the motions of a ſquirrel in a cage; which uſes perpetual exertion to exhauſt a part of its accumulated ſenſorial power. This is one ſource of our general propenſity to action; another perhaps ariſes from our curioſity or expectation of novelty mentioned in the note on l. 145, of this canto.

But the immediate cauſe of our propenſity to imitation above that of other animals ariſes from the greater facility, with which by the ſenſe of touch we acquire the ideas of the outlines of objects, and afterwards in conſequence by the ſenſe of ſight; this ſeems to have been obſerved by Ariſtotle, who calls man, "the imitative animal;" ſee Zoonomia, Vol. I. Sect. XXII.

Or, as they flow from each tranſlucent ſource,
Purſue Aſſociation's endleſs courſe.

" Hence when the inquiring hands with contact fine
Trace on hard forms the circumſcribing line; 280
Which then the language of the rolling eyes
From diſtant ſcenes of earth and heaven ſupplies;
Thoſe clear ideas of the touch and ſight
Rouſe the quick ſenſe to anguiſh or delight;
Whence the fine power of IMITATION ſprings,
And apes the outlines of external things;
With ceaſeleſs action to the world imparts
All moral virtues, languages, and arts.
Firſt the charm'd Mind mechanic powers collects,
Means for ſome end, and cauſes of effects; 290
Then learns from other Minds their joys and fears,
Contagious ſmiles and ſympathetic tears.

All moral virtues, l. 288. See the ſequel of this canto, l. 453 on ſympathy; and l. 331 on language; and the ſubſequent lines on the arts of painting and architecture.

"What one fine ſtimulated Senſe diſcerns,
Another Senſe by IMITATION learns.—
So in the graceful dance the ſtep ſublime
Learns from the ear the concordance of Time.
So, when the pen of ſome young artiſt prints
Recumbent Nymphs in TITIAN's living tints;
The glowing limb, fair cheek, and flowing hair,
Reſpiring boſom, and ſeductive air, 300
He juſtly copies with enamour'd ſigh
From Beauty's image pictured on his eye.

"Thus when great ANGELO in wondering Rome
Fix'd the vaſt pillars of Saint Peter's dome,

Another Senſe, l. 294. As the part of the organs of touch or of ſight which is ſtimulated into action by a tangible or viſible object, muſt reſemble in figure at leaſt the figure of that object, as it thus conſtitutes an idea; it may be ſaid to imitate the figure of that object; and thus imitation may be eſteemed coeval with the exiſtence both of man and other animals: but this would confound perception with imitation; which latter is better defined from the actions of one ſenſe copying thoſe of another.

Thus when great Angelo, l. 303. The origin of this propen-

Rear'd rocks on rocks ſublime, and hung on high
A new Pantheon in the affrighted ſky,
Each maſſy pier, now join'd and now aloof,
The figured architraves, and vaulted roof,

ſity to imitation has not been deduced from any known principle; when any action preſents itſelf to the view of a child, as of whetting a knife, or threading a needle; the parts of this action in reſpect of time, motion, figure, are imitated by parts of the retina of his eye; to perform this action therefore with his hands is eaſier to him than to invent any new action; becauſe it conſiſts in repeating with another ſet of fibres, viz. with the moving muſcles, what he had juſt performed by ſome parts of the retina; juſt as in dancing we transfer the times of the motions from the actions of the auditory nerves to the muſcles of the limbs. Imitation therefore conſiſts of repetition, which is the eaſieſt kind of animal action; as the ideas or motions become preſently aſſociated together; which adds to the facility of their production; as ſhown in Zoonomia, Vol. I. Sect. XXII. 2.

It ſhould be added, that as our ideas, when we perceive external objects, are believed to conſiſt in the actions of the immediate organs of ſenſe, in conſequence of the ſtimulus of thoſe objects; ſo when we think of external objects, our ideas are believed to conſiſt in the repetitions of the actions of the immediate organs of ſenſe, excited by the other ſenſorial powers of volition, ſenſation, or aſſociation.

Aiſles, whoſe broad curves gigantic ribs ſuſtain,
Where holy echoes chant the adoring ſtrain; 310
The central altar, ſacred to the Lord,
Admired by Sages, and by Saints ador'd,
Whoſe brazen canopy aſcends ſublime
On ſpiral columns unafraid of Time,
Were firſt by Fancy in ethereal dyes
Plann'd on the rolling tablets of his eyes;
And his true hand with imitation fine
Traced from his Retina the grand deſign.

"The Muſe of MIMICRY in every age
With ſilent language charms the attentive ſtage; 320

The Muſe of Mimicry, l. 319. Much of the pleaſure received from the drawings of flowers finely finiſhed, or of portraits, is derived from their imitation or reſemblance of the objects or perſons which they repreſent. The ſame occurs in the pleaſure we receive from mimicry on the ſtage; we are ſurpriſed at the accuracy of its enacted reſemblance. Some part of the pleaſure received from architecture, as when we contemplate the internal ſtructure of gothic temples, as of King's College chapel in Cambridge, or of Lincoln Cathedral, may ariſe alſo from their imitation or reſemblance of thoſe ſuperb avenues of large trees, which were formerly appropriated to religious ceremonies.

The Monarch's ſtately ſtep, and tragic pauſe,
The Hero bleeding in his country's cauſe,
O'er her fond child the dying Mother's tears,
The Lover's ardor, and the Virgin's fears;
The tittering Nymph, that tries her comic taſk,
Bounds on the ſcene, and peeps behind her maſk,
The Punch and Harlequin, and graver throng,
That ſhake the theatre with dance and ſong,
With endleſs trains of Angers, Loves, and Mirths,
Owe to the Muſe of Mimicry their births. 330

" Hence to clear images of form belong
The ſculptor's ſtatue, and the poet's ſong,
The painter's landſcape, and the builder's plan,
And IMITATION marks the mind of Man.

Imitation marks, l. 334. Many other curious inſtances of one part of the animal ſyſtem imitating another part of it, as in ſome contagious diſeaſes; and alſo of ſome animals imitating each other, are given in Zoonomia, Vol. I. Sect. XXII. 3. To which may be added, that this propenſity to imitation not only appears in the actions of children, but in all the cuſtoms and faſhions of the

VI. "When ſtrong deſires or ſoft ſenſations move
The aſtoniſh'd Intellect to rage or love;
Aſſociate tribes of fibrous motions riſe,
Fluſh the red cheek, or light the laughing eyes.
Whence ever-active Imitation finds
The ideal trains, that paſs in kindred minds; 340
Her mimic arts aſſociate thoughts excite
And the firſt Language enters at the ſight.

world; many thouſands tread in the beaten paths of others, who precede or accompany them, for one who traverſes regions of his own diſcovery.

And the firſt Language, l. 342. There are two ways by which we become acquainted with the paſſions of others: firſt, by having obſerved the effects of them, as of fear or anger, on our own bodies, we know at ſight when others are under the influence of theſe affections. So children, long before they can ſpeak, or underſtand the language of their parents, may be frightened by an angry countenance, or ſoothed by ſmiles and blandiſhments.

Secondly, when we put ourſelves into the attitude that any paſſion naturally occaſions, we ſoon in ſome degree acquire

"Thus jealous quails or village-cocks inſpect
Each other's necks with ſtiffen'd plumes erect;
Smit with the wordleſs eloquence, they know
The rival paſſion of the threatning foe.
So when the famiſh'd wolves at midnight howl,
Fell ſerpents hiſs, or fierce hyenas growl;
Indignant Lions rear their briſtling mail,
And laſh their ſides with undulating tail. 350
Or when the Savage-Man with clenched fiſt
Parades, the ſcowling champion of the liſt;

that paſſion; hence when thoſe that ſcold indulge themſelves in loud oaths and violent actions of the arms, they increaſe their anger by the mode of expreſſing themſelves; and on the contrary, the counterfeited ſmile of pleaſure in diſagreeable company ſoon brings along with it a portion of the reality, as is well illuſtrated by Mr. Burke. (Eſſay on the Sublime and Beautiful.)

Theſe are natural ſigns by which we underſtand each other, and on this ſlender baſis is built all human language. For without ſome natural ſigns no artificial ones could have been invented or underſtood, as is very ingeniouſly obſerved by Dr. Reid. (Inquiry into the Human Mind.)

With brandiſh'd arms, and eyes that roll to know
Where firſt to fix the meditated blow;
Aſſociation's myſtic power combines
Internal paſſions with external ſigns.

"From theſe dumb geſtures firſt the exchange began
Of viewleſs thought in bird, and beaſt, and man;
And ſtill the ſtage by mimic art diſplays
Hiſtoric pantomime in modern days; 360
And hence the enthuſiaſt orator affords
Force to the feebler eloquence of words.

"Thus the firſt Language, when we frown'd or ſmiled,
Roſe from the cradle, Imitation's child;
Next to each thought aſſociate ſound accords,
And forms the dulcet ſymphony of words;
The tongue, the lips articulate; the throat
With ſoft vibration modulates the note;

Love, pity, war, the ſhout, the ſong, the prayer
Form quick concuſſions of elaſtic air. 370

"Hence the firſt accents bear in airy rings
The vocal ſymbols of ideal things,

Hence the firſt accents, l. 371. Words were originally the ſigns or names of individual ideas; but in all known languages many of them by changing their terminations expreſs more than one idea, as in the caſes of nouns, and the moods and tenſes of verbs. Thus a whip ſuggeſts a ſingle idea of that inſtrument; but "to whip," ſuggeſts an idea of action, joined with that of the inſtrument, and is then called a verb; and "to be whipped," ſuggeſts an idea of being acted upon or ſuffering. Thus in moſt languages two ideas are ſuggeſted by one word by changing its termination; as amor, love; amare, to love; amari, to be loved. Nouns are the names of the ideas of things, firſt as they are received by the ſtimulus of objects, or as they are afterwards repeated; ſecondly, they are names of more abſtracted ideas, which do not ſuggeſt at the ſame time the external objects, by which they were originally excited; or thirdly, of the operations of our minds, which are termed reflex ideas by metaphyſical writers; or laſtly, they are the names of our ideas of parts or properties of objects; and are termed by grammarians nouns adjective.

Verbs are alſo in reality names of our ideas of things, or

Name each nice change appulſive powers ſupply
To the quick ſenſe of touch, or ear or eye.
Or in fine traits abſtracted forms ſuggeſt
Of Beauty, Wiſdom, Number, Motion, Reſt;
Or, as within reflex ideas move,
Trace the light ſteps of Reaſon, Rage, or Love.
The next new ſounds adjunctive thoughts recite,
As hard, odorous, tuneful, ſweet, or white. 380
The next the fleeting images ſelect
Of action, ſuffering, cauſes and effect;
Or mark exiſtence, with the march ſublime
O'er earth and ocean of recording Time.

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nouns, with the addition of another idea to them, as of acting or ſuffering; or of more than one other annexed idea, as of time, and alſo of exiſtence. Theſe with the numerous abbreviations, ſo well illuſtrated by Mr. Horne Tooke in his Diverſions of Purley, make up the general theory of language, which conſiſts of the ſymbols of ideas repreſented by vocal or written words; or by parts of thoſe words, as their terminations; or by their diſpoſition in reſpect to their order or ſucceſſion; as further explained in Additional Note XIV.

"The GIANT FORM on Nature's centre ſtands,
And waves in ether his unnumber'd hands;
Whirls the bright planets in their ſilver ſpheres,
And the vaſt ſun round other ſyſtems ſteers;
Till the laſt trump amid the thunder's roar
Sound the dread Sentence "TIME SHALL BE NO MORE!"

"Laſt ſteps Abbreviation, bold and ſtrong, 391
And leads the volant trains of words along;
With ſweet loquacity to HERMES ſprings,
And decks his forehead and his feet with wings.

VII. "As the ſoft lips and pliant tongue are taught
With other minds to interchange the thought;
And ſound, the ſymbol of the ſenſe, explains
In parted links the long ideal trains;
From clear conceptions of external things
The facile power of Recollection ſprings. 400

In parted links, l. 398. As our ideas conſiſt of ſucceſſive

"Whence REASON'S empire o'er the world preſides,
And man from brute, and man from man divides;

trains of the motions, or changes of figure, of the extremities of the nerves of one or more of our ſenſes, as of the optic or auditory nerves; theſe ſucceſſive trains of motion, or configuration, are in common life divided into many links, to each of which a word or name is given, and it is called an idea. This chain of ideas may be broken into more or fewer links, or divided in different parts of it, by the cuſtoms of different people. Whence the meanings of the words of one languege cannot always be exactly expreſſed by thoſe of another; and hence the acquirement of different languages in their infancy may affect the modes of thinking and reaſoning of whole nations, or of different claſſes of ſociety; as the words of them do not accurately ſuggeſt the ſame ideas, or parts of ideal trains; a circumſtance which has not been ſufficiently analyſed.

Whence Reaſon's empire, l. 401. The facility of the uſe of the voluntary power, which is owing to the poſſeſſion of the clear ideas acquired by our ſuperior ſenſe of touch, and afterwards of viſion, diſtinguiſhes man from brutes, and has given him the empire of the world, with the power of improving nature by the exertions of art.

Reaſoning is that operation of the ſenſorium by which we excite two or many tribes of ideas, and then reexcite the ideas

Compares and meaſures by imagined lines
Ellipſes, circles, tangents, angles, ſines;
Repeats with nice libration, and decrees
In what each differs, and in what agrees;
With quick Volitions unfatigued ſelects
Means for ſome end, and cauſes of effects;
All human ſcience worth the name imparts,
And builds on Nature's baſe the works of Arts. 410

"The Waſp, fine architect, ſurrounds his domes
With paper-foliage, and ſuſpends his combs;

in which they differ or correſpond. If we determine this difference, it is called judgment; if we in vain endeavour to determine it, it is called doubting.

If we reexcite the ideas in which they differ, it is called diſtinguiſhing. If we reexcite thoſe in which they correſpond, it is called comparing.

The Waſp, fine architect, l. 411. Thoſe animals which poſſeſs a better ſenſe of touch are, in general, more ingenious than others. Thoſe which have claviculæ, or collar-bones, and thence uſe the forefeet as hands, as the monkey, ſquirrel, rat, are more ingenious in ſeizing their prey or eſcaping from danger. And the ingenuity of the elephant appears to riſe

Secured from froſt the Bee induſtrious dwells,
And fills for winter all her waxen cells;
The cunning Spider with adheſive line
Weaves his firm net immeaſurably fine;
The Wren, when embryon eggs her cares engroſs,
Seeks the ſoft down, and lines the cradling moſs;
Conſcious of change the Silkworm-Nymphs begin
Attach'd to leaves their gluten-threads to ſpin; 420
Then round and round they weave with circling heads
Sphere within Sphere, and form their ſilken beds.

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from the ſenſe of touch at the extremity of his proboſcis, which has a prominence on one ſide of its cavity like a thumb to cloſe againſt the other ſide of it, by which I have ſeen him readily pick up a ſhilling which was thrown amongſt the ſtraw he ſtood upon. Hence the excellence of the ſenſe of touch in many inſects ſeems to have given them wonderful ingenuity ſo as to equal or even excel mankind in ſome of their arts and diſcoveries; many of which may have been acquired in ſituations previous to their preſent ones, as the great globe itſelf, and all that it inhabit, appear to be in a perpetual ſtate of mutation and improvement; ſee Additional Note IX.

—Say, did theſe fine volitions firſt commence
From clear ideas of the tangent ſenſe;
From ſires to ſons by imitation caught,
Or in dumb language by tradition taught?
Or did they riſe in ſome primeval ſite
Of larva-gnat, or microſcopic mite;
And with inſtructive foreſight ſtill await
On each viciſſitude of inſect-ſtate?— 430
Wiſe to the preſent, nor to future blind,
They link the reaſoning reptile to mankind!
—Stoop, ſelfiſh Pride! ſurvey thy kindred forms,
Thy brother Emmets, and thy ſiſter Worms!

"Thy potent acts, VOLITION, ſtill attend
The means of pleaſure to ſecure the end;

Thy potent acts, Volition, l. 435. It was before obſerved, how much the ſuperior accuracy of our ſenſe of touch contributes to increaſe our knowledge; but it is the greater energy and activity of the power of volition, that marks mankind, and has given them the empire of the world.

There is a criterion by which we may diſtinguiſh our vo-

To expreſs his wiſhes and his wants deſign'd
Language, the *means*, diſtinguiſhes Mankind;
For *future* works in Art's ingenious ſchools
His hands unwearied form and finiſh tools; 440
He toils for money *future* bliſs to ſhare,
And ſhouts to Heaven his mercenary prayer.
Sweet Hope delights him, frowning Fear alarms,
And Vice and Virtue court him to their arms.

"Unenvied eminence, in Nature's plan
Riſe the reflective faculties of Man!

luntary acts or thoughts from thoſe that are excited by our ſenſations: "The former are always employed about the means to acquire pleaſurable objects, or to avoid painful ones; while the latter are employed about the poſſeſſion of thoſe that are already in our power."

The ideas and actions of brutes, like thoſe of children, are almoſt perpetually produced by their preſent pleaſures or their preſent pains; and they ſeldom buſy themſelves about the *means* of procuring future bliſs, or of avoiding future miſery.

Whilſt the acquiring of languages, the making of tools, and the labouring for money, which are all only the *means* of procuring pleaſure; and the praying to the Deity as another means to procure happineſs, are characteriſtic of human nature.

Labour to Reſt the thinking Few prefer!
Know but to mourn! and reaſon but to err!—
In Eden's groves, the cradle of the world,
Bloom'd a fair tree with myſtic flowers unfurl'd; 450
On bending branches, as aloft it ſprung,
Forbid to taſte, the fruit of KNOWLEDGE hung;
Flow'd with ſweet Innocence the tranquil hours,
And Love and Beauty warm'd the bliſsful bowers.
Till our deluded Parents pluck'd, erelong,
The tempting fruit, and gather'd Right and Wrong;
Whence Good and Evil, as in trains they paſs,
Reflection imaged on her poliſh'd glaſs;

And gather'd Right and Wrong, l. 456. Some philoſophers have believed that the acquiſition of knowledge diminiſhes the happineſs of the poſſeſſor; an opinion which ſeems to have been inculcated by the hiſtory of our firſt parents, who are ſaid to have become miſerable from eating of the tree of knowledge. But as the foreſight and the power of mankind are much increaſed by their voluntary exertions in the acquirement of knowledge, they may undoubtedly avoid many ſources of evil, and procure many ſources of good; and yet poſſeſs the pleaſures of ſenſe, or of imagination, as extenſively as the brute or the ſavage.

And Conſcience felt, for blood by Hunger ſpilt,
The pains of ſhame, of ſympathy, and guilt! 460

VIII. "Last, as obſervant Imitation ſtands,
Turns her quick glance, and brandiſhes her hands,
With mimic acts aſſociate thoughts excites,
And ſtorms the ſoul with ſorrows or delights;
Life's ſhadowy ſcenes are brighten'd and refined,
And ſoft emotions mark the feeling mind.

And ſoft emotions, l. 466. From our aptitude to imitation ariſes what is generally underſtood by the word ſympathy, ſo well explained by Dr. Smith of Glaſgow. Thus the appearance of a cheerful countenance gives us pleaſure, and of a melancholy one makes us ſorrowful. Yawning, and ſometimes vomiting, are thus propagated by ſympathy; and ſome people of delicate fibres, at the preſence of a ſpectacle of miſery, have felt pain in the ſame parts of their bodies, that were diſeaſed or mangled in the object they ſaw.

The effect of this powerful agent in the moral world, is the foundation of all our intellectual ſympathies with the pains and pleaſures of others, and is in conſequence the ſource of all our virtues. For in what conſiſts our ſympathy with the miſeries or with the joys of our fellow-creatures, but in an involuntary exci-

"The Seraph, SYMPATHY, from Heaven deſcends,
And bright o'er earth his beamy forehead bends;
On Man's cold heart celeſtial ardor flings,
And ſhowers affection from his ſparkling wings; 470
Rolls o'er the world his mild benignant eye,
Hears the lone murmur, drinks the whiſper'd ſigh;
Lifts the cloſed latch of pale Misfortune's door,
Opes the clench'd hand of Avarice to the poor,
Unbars the priſon, liberates the ſlave,
Sheds his ſoft ſorrows o'er the untimely grave,
Points with uplifted hand to realms above,
And charms the world with univerſal love.

"O'er the thrill'd frame his words aſſuaſive ſteal,
And teach the ſelfiſh heart what others feel; 480
With ſacred truth each erring thought control,
Bind ſex to ſex, and mingle ſoul with ſoul;

---

tation of ideas in ſome meaſure ſimilar or imitative of thoſe which we believe to exiſt in the minds of the perſons whom we commiſſerate or congratulate.

From heaven, He cried, deſcends the moral plan,
And gives Society to ſavage man.

" High on yon ſcroll, inſcribed o'er Nature's ſhrine,
Live in bright characters the words divine,
" IN LIFE'S DISASTROUS SCENES TO OTHERS DO,
WHAT YOU WOULD WISH BY OTHERS DONE TO YOU."
—Winds! wide o'er earth the ſacred law convey,
Ye Nations, hear it! and ye Kings, obey! 490

High on yon ſcroll, l. 485. The famous ſentence of Socrates " Know thyſelf," ſo celebrated by writers of antiquity, and ſaid by them to have deſcended from Heaven, however wiſe it may be, ſeems to be rather of a ſelfiſh nature; and the author of it might have added " Know alſo other people." But the ſacred maxims of the author of Chriſtianity, " Do as you would be done by," and " Love your neighbour as yourſelf," include all our duties of benevolence and morality; and, if ſincerely obeyed by all nations, would a thouſand-fold multiply the preſent happineſs of mankind.

"Unbreathing wonder huſh'd the adoring throng,
Froze the broad eye, and chain'd the ſilent tongue;
Mute was the wail of Want, and Miſery's cry,
And grateful Pity wiped her lucid eye;
Peace with ſweet voice the Seraph-form addreſs'd,
And Virtue claſp'd him to her throbbing breaſt."

END OF CANTO III.

ORIGIN OF SOCIETY.

CANTO IV.

OF GOOD AND EVIL.

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CANTO IV.

OF GOOD AND EVIL.

I. "How few," the Muse in plaintive accents
cries,
And mingles with her words pathetic ſighs.—
"How few, alas! in Nature's wide domains
The ſacred charm of Sympathy reſtrains!
Uncheck'd deſires from appetite commence,
And pure reflection yields to ſelfiſh ſenſe!
—Bleſt is the Sage, who learn'd in Nature's laws
With nice diſtinction marks effect and cauſe;

Bleſt is the Sage, l. 7.

> Felix, qui potuit rerum cognoſcere cauſas;
> Quique metus omnes, et inexorabile fatum,
> Subjecit pedibus, ſtrepitumque Acherontis avari.
>
> Virg. Georg. II. 490.

Who views the inſatiate Grave with eye ſedate,
Nor fears thy voice, inexorable Fate! 10

"When War, the Demon, lifts his banner high,
And loud artillery rends the affrighted ſky;
Swords claſh with ſwords, on horſes horſes ruſh;
Man tramples man, and nations nations cruſh,
Death his vaſt ſithe with ſweep enormous wields,
And ſhuddering Pity quits the ſanguine fields.

"The wolf, eſcorted by his milk-drawn dam,
Unknown to mercy, tears the guiltleſs lamb;
The towering eagle, darting from above,
Unfeeling rends the inoffenſive dove; 20
The lamb and dove on living nature feed,
Crop the young herb, or cruſh the embryon ſeed.
Nor ſpares the loud owl in her duſky flight,
Smit with ſweet notes, the minſtrel of the night;

The towering eagle, l. 19.

Torva leæna lupum ſequitur, lupus ipſe capellam,
Florentem cytiſum ſequitur laſciva capella. VIRG.

Nor ſpares enamour'd of his radiant form,
The hungry nightingale the glowing worm;
Who with bright lamp alarms the midnight hour,
Climbs the green ſtem, and ſlays the ſleeping
flower.

"Fell Oeſtrus buries in her rapid courſe
Her countleſs brood in ſtag, or bull, or horſe; 30
Whoſe hungry larva eats its living way,
Hatch'd by the warmth, and iſſues into day.

Fell Oestrus buries, l. 29. The gadfly, bot-fly, or ſheep-fly: the larva lives in the bodies of cattle throughout the whole winter; it is extracted from their backs by an African bird called Buphaga. Adhering to the anus it artfully introduces itſelf into the inteſtines of horſes, and becomes ſo numerous in their ſtomachs, as ſometimes to deſtroy them; it climbs into the noſtrils of ſheep and calves, and producing a neſt of young in a tranſparent hydatide in the frontal ſinus, occaſions the vertigo or turn of thoſe animals. In Lapland it ſo attacks the rein deer that the natives annually travel with the herds from the woods to the mountains. Lin. Syſt. Nat.

The wing'd Ichneumon for her embryon young
Gores with ſharp horn the caterpillar throng.
The cruel larva mines its ſilky courſe,
And tears the vitals of its foſtering nurſe.

The wing'd Ichneumon, l. 33. Linnæus deſcribes ſeventy-ſeven ſpecies of the ichneumon fly, ſome of which have a ſting as long and ſome twice as long as their bodies. Many of them inſert their eggs into various caterpillars, which when they are hatched ſeem for a time to prey on the reſervoir of ſilk in the backs of thoſe animals deſigned for their own uſe to ſpin a cord to ſupport them, or a bag to contain them, while they change from their larva form to a butterfly; as I have ſeen in above fifty cabbage-caterpillars. The ichneumon larva then makes its way out of the caterpillar, and ſpins itſelf a ſmall cocoon like a ſilk-worm; theſe cocoons are about the ſize of a ſmall pin's head, and I have ſeen about ten of them on each cabbage caterpillar, which ſoon dies after their excluſion.

Other ſpecies of ichneumon inſert their eggs into the aphis, and into the larva of the aphidivorous fly; others into the bedeguar of roſe trees, and the gall-nuts of oaks; whence thoſe excreſcences ſeem to be produced, as well as the hydatides in the frontal ſinus of ſheep and calves by the ſtimulús of the larvæ depoſited in them.

While fierce Libellula with jaws of ſteel
Ingulfs an inſect-province at a meal;
Contending bee-ſwarms riſe on ruſtling wings,
And ſlay their thouſands with envenom'd ſtings. 40

"Yes! ſmiling Flora drives her armed car
Through the thick ranks of vegetable war;
Herb, ſhrub, and tree, with ſtrong emotions riſe
For light and air, and battle in the ſkies;
Whoſe roots diverging with oppoſing toil
Contend below for moiſture and for ſoil;
Round the tall Elm the flattering Ivies bend,
And ſtrangle, as they claſp, their ſtruggling friend;

While fierce Libellula, l. 37. The Libellula or Dragon-fly is ſaid to be a moſt voracious animal; Linnæus ſays in their perfect ſtate they are the hawks to naked winged flies; in their larva ſtate they run beneath the water, and are the cruel crocodiles of aquatic inſects. Syſt. Nat.

Contending bee-ſwarms, l. 39. Stronger bee-ſwarms frequently attack weak hives, and in two or three days deſtroy them and carry away their honey; this I once prevented by removing the attacked hive after the firſt day's battle to a diſtinct part of the garden. See Phytologia, Sect. XIV. 3. 7.

Envenom'd dews from Mancinella flow,
And ſcald with cauſtic touch the tribes below; 50
Denſe ſhadowy leaves on ſtems aſpiring borne
With blight and mildew thin the realms of corn;
And inſect hordes with reſtleſs tooth devour
The unfolded bud, and pierce the ravell'd flower.

"In ocean's pearly haunts, the waves beneath
Sits the grim monarch of inſatiate Death;
The ſhark rapacious with deſcending blow
Darts on the ſcaly brood, that ſwims below;
The crawling crocodiles, beneath that move,
Arreſt with riſing jaw the tribes above; 60

The ſhark rapacious, l. 57. The ſhark has three rows of ſharp teeth within each other, which he can bend downwards internally to admit larger prey, and raiſe to prevent its return; his ſnout hangs ſo far over his mouth, that he is neceſſitated to turn upon his back, when he takes fiſh that ſwim over him, and hence ſeems peculiarly formed to catch thoſe that ſwim under him.

The crawling crocodiles, l. 59. As this animal lives chiefly at the bottom of the rivers, which he frequents, he has the

With monſtrous gape ſepulchral whales devour
Shoals at a gulp, a million in an hour.
—Air, earth, and ocean, to aſtoniſhed day
One ſcene of blood, one mighty tomb diſplay!
From Hunger's arm the ſhafts of Death are hurl'd,
And one great Slaughter-houſe the warring world!

power of opening the upper jaw as well as the under one, and thus with greater facility catches the fiſh or water-fowl which ſwim over him.

One great ſlaughter-houſe, l. 66. As vegetables are an inferior order of animals fixed to the ſoil; and as the locomotive animals prey upon them, or upon each other; the world may indeed be ſaid to be one great ſlaughter-houſe. As the digeſted food of vegetables conſiſts principally of ſugar, and from this is produced again their mucilage, ſtarch, and oil, and ſince animals are ſuſtained by theſe vegetable productions, it would ſeem that the ſugar-making proceſs carried on in vegetable veſſels was the great ſource of life to all organized beings. And that if our improved chemiſtry ſhould ever diſcover the art of making ſugar from foſſile or aerial matter without the aſſiſtance of vegetation, food for animals would then become as plentiful as water, and they might live upon the earth without preying on each other, as thick as blades of graſs, with no reſtraint to their numbers but the want of local room.

"THE brow of Man erect, with thought elate,
Ducks to the mandate of reſiſtleſs fate;
Nor Love retains him, nor can Virtue ſave
Her ſages, ſaints, or heroes from the grave. 70
While cold and hunger by defect oppreſs,
Repletion, heat, and labour by exceſs,

It would ſeem that roots fixed in the earth and leaves innumerable waving in the air were neceſſary for the decompoſition of water and air, and the converſion of them into ſaccharine matter, which would have been not only cumberous but totally incompatible with the locomotion of animal bodies. For how could a man or quadruped have carried on his head or back a foreſt of leaves, or have had long branching lacteal or abſorbent veſſels terminating in the earth? Animals therefore ſubſiſt on vegetables; that is they take the matter ſo prepared, and have organs to prepare it further for the purpoſes of higher animation and greater ſenſibility.

While cold and hunger, l. 71. Thoſe parts of our ſyſtem, which are in health excited into perpetual action, give us pain, when they are not excited into action; thus when the hands are for a time immerſed in ſnow, an inaction of the cutaneous capillaries is induced, as is ſeen from the paleneſs of the ſkin, which is attended with the pain of coldneſs. So the pain of hunger is probably produced by the inaction of the muſcular fibres of the ſtomach from the want of the ſtimulus of food.

The whip, the ſting, the ſpur, the fiery brand,
And, curſed Slavery! thy iron hand;
And led by Luxury Diſeaſe's trains
Load human life with unextinguiſh'd pains.

"Here laughs Ebriety more fell than arms,
And thins the nations with her fatal charms,
With Gout, and Hydrops groaning in her train,
And cold Debility, and grinning Pain, 80
With harlot's ſmiles deluded man ſalutes,
Revenging all his cruelties to brutes!

Thus thoſe, who have uſed much voluntary exertion in their early years, and have continued to do ſo, till the decline of life commences, if they then lay aſide their employment, whether that of a miniſter of ſtate, a general of an army, or a merchant, or manufacturer; they ceaſe to have their faculties excited into their uſual activity, and become unhappy, I ſuppoſe from the too great accumulation of the ſenſorial power of volition; which wants the accuſtomed ſtimulus or motive to cauſe its expenditure.

Here laughs Ebriety. l. 77.

Sævior armis
Luxuria incubuit, victumque ulciſcitur orbem. HORAC.

There the curſt ſpells of Superſtition blind,
And fix her fetters on the tortured mind;
She bids in dreams tormenting ſhapes appear,
With ſhrieks that ſhock Imagination's ear,
E'en o'er the grave a deeper ſhadow flings,
And maddening Conſcience darts a thouſand ſtings.

"There writhing Mania ſits on Reaſon's throne,
Or Melancholy marks it for her own, 90
Sheds o'er the ſcene a voluntary gloom,
Requeſts oblivion, and demands the tomb.

E'en o'er the grave, l. 87. Many theatric preachers among the Methodiſts ſucceſsfully inculate the fear of death and of Hell, and live luxuriouſly on the folly of their hearers: thoſe who ſuffer under this inſanity, are generally moſt innocent and harmleſs people, who are then liable to accuſe themſelves of the greateſt imaginary crimes; and have ſo much intellectual cowardice, that they dare not reaſon about thoſe things, which they are directed by their prieſts to believe. Where this intellectual cowardice is great, the voice of reaſon is ineffectual; but that of ridicule may ſave many from theſe mad-making doctors; as the farces of Mr. Foote; though it is too weak to cure thoſe who are already hallucinated.

And laſt Aſſociation's trains ſuggeſt
Ideal ills, that harrow up the breaſt,
Call for the dead from Time's o'erwhelming main,
And bid departed Sorrow live again.

"Here ragged Avarice guards with bolted door
His uſeleſs treaſures from the ſtarving poor;

And laſt Aſſociation, l. 93. The miſeries and the felicities of life may be divided into thoſe which ariſe in conſequence of irritation, ſenſation, volition, and aſſociation; and conſiſt in the actions of the extremities of the nerves of ſenſe, which conſtitute our ideas; if they are much more exerted than uſual, or much leſs exerted than uſual, they occaſion pain; as when the finger is burnt in a candle; or when we go into a cold bath; while their natural degree of exertion produces the pleaſure of life or exiſtence. This pleaſure is nevertheleſs increaſed, when the ſyſtem is ſtimulated into rather ſtronger action than uſual, as after a copious dinner, and at the beginning of intoxication; and diminiſhed, when it is only excited into ſomewhat leſs activity than uſual, which is termed ennui, or irkſomeneſs of life.

Ideal ills, l. 94. The tooth-edge is an inſtance of bodily pain occaſioned by aſſociation of ideas. Every one in his childhood has repeatedly bit a part of the glaſs or earthern veſſel, in which his food has been given him, and has thence had a diſagreeable

Loads the lorn hours with miſery and care,
And lives a beggar to enrich his heir.
Unthinking crowds thy forms, Impoſture, gull,
A Saint in ſackcloth, or a Wolf in wool.
While mad with fooliſh fame, or drunk with power,
Ambition ſlays his thouſands in an hour;
Demoniac Envy ſcowls with haggard mien,
And blights the bloom of other's joys, unſeen;
Or wrathful Jealouſy invades the grove,
And turns to night meridian beams of Love!

"Here wide o'er earth impetuous waters ſweep,
And fields and foreſts ruſh into the deep;

ſenſation in his teeth, attended at the ſame time with a jarring ſound: and ever after, when ſuch a ſound is accidentally produced, the diſagreeable ſenſation of the teeth follows by aſſociation of ideas; this is further elucidated in Zoonomia, Vol. I. Sect. XVI. 10.

Enrich his heir, l. 100.

> Cum furor haud dubius, cum ſit manifeſta phrenitis,
> Ut locuples moriaris, egenti vivere fato. JUVENAL.

A Wolf in wool, l. 102. A wolf in ſheep's clothing.

Or dread Volcano with exploſion dire
Involves the mountains in a flood of fire;
Or yawning Earth with cloſing jaws inhumes
Unwarned nations, living in their tombs;
Or Famine ſeizes with her tiger-paw,
And ſwallows millions with unſated maw.

"There livid Peſtilence in league with Dearth
Walks forth malignant o'er the ſhuddering earth,
Her rapid ſhafts with airs volcanic wings,
Or ſteeps in putrid vaults her venom'd ſtings. 120
Arreſts the young in Beauty's vernal bloom,
And bears the innocuous ſtrangers to the tomb!—

"AND now, e'en I, whoſe verſe reluctant sing
The changeful ſtate of ſublunary things,

With airs volcanic, l. 119. Thoſe epidemic complaints, which are generally termed influenza, are believed to ariſe from vapours thrown out from earthquakes in ſuch abundance as to affect large regions of the atmoſphere, ſee Botanic Garden, V. I. Canto IV. l. 65. while the diſeaſes properly termed contagious originate from the putrid effluvia of decompoſing animal or vegetable matter.

Bend o'er Mortality with ſilent ſighs,
And wipe the ſecret tear-drops from my eyes,
Hear through the night one univerſal groan,
And mourn unſeen for evils not my own,
With reſtleſs limbs and throbbing heart complain,
Stretch'd on the rack of ſentimental pain! 130
—Ah where can Sympathy reflecting find
One bright idea to conſole the mind?

Sentimental pain, l. 130. Children ſhould be taught in their early education to feel for all the remediable evils, which they obſerve in others; but they ſhould at the ſame time be taught ſufficient firmneſs of mind not entirely to deſtroy their own happineſs by their ſympathizing with too great ſenſibility with the numerous irremediable evils, which exiſt in the preſent ſyſtem of the world: as by indulging that kind of melancholy they decreaſe the ſum total of public happineſs; which is ſo far rather reprehenſible than commendable. See Plan for Female Education by Dr. Darwin, Johnſon, London, Sect. XVII.

This has been carried to great exceſs in the Eaſt by the diſciples of Confucius; the Gentoos during a famine in India refuſed to eat the fleſh of cows and of other animals to ſatisfy their hunger, and ſave themſelves from death. And at other times they have been ſaid to permit fleas and muſquitoes to feed upon them from this erroneous ſympathy.

One ray of light in this terrene abode
To prove to Man the Goodneſs of his GOD ?"

II. "HEAR, O YE SONS OF TIME!" the
Nymph replies,
Quick indignation darting from her eyes;
"When in ſoft tones the Muſe lamenting ſings,
And weighs with tremulous hand the ſum of things;
She loads the ſcale in melancholy mood,
Preſents the evil, but forgets the good. 140
But if the beam ſome firmer hand ſuſpends,
And good and evil load the adverſe ends;
With ſtrong libration, where the Good abides,
Quick nods the beam, the ponderous gold ſubſides.

"HEAR, O ye Sons of Time! the powers of Life
Arreſt the elements, and ſtay their ſtrife;
From wandering atoms, ethers, airs, and gas,
By combination form the organic maſs;

From wandering atoms, l. 147. Had thoſe ancient philoſophers, who contended that the world was formed from atoms, aſcribed

And,—as they ſeize, digeſt, ſecrete,—diſpenſe
The bliſs of Being to the vital Ens. 150
Hence in bright groups from Irritation riſe
Young Pleaſure's trains, and roll their azure eyes.

"With fond delight we feel the potent charm,
When Zephyrs cool us, or when ſun-beams warm;
With fond delight inhale the fragrant flowers,
Taſte the ſweet fruits, which bend the bluſhing bowers,
Admire the muſic of the vernal grove,
Or drink the raptures of delirious love.

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their combinations to certain immutable properties received from the hand of the Creator, ſuch as general gravitation, chemical affinity, or animal appetency, inſtead of aſcribing them to a blind chance; the doctrine of atoms, as conſtituting or compoſing the material world by the variety of their combinations, ſo far from leading the mind to atheiſm, would ſtrengthen the demonſtration of the exiſtence of a Deity, as the firſt cauſe of all things; becauſe the analogy reſulting from our perpetual experience of cauſe and effect would have thus been exemplified through univerſal nature.

“ So with long gaze admiring eyes behold
The varied landſcape all its lights unfold; 160
Huge rocks oppoſing o'er the ſtream project
Their naked boſoms, and the beams reflect;
Wave high in air their fringed creſts of wood,
And checker'd ſhadows dance upon the flood;
Green ſloping lawns conſtruct the ſidelong ſcene,
And guide the ſparkling rill that winds between;
Conduct on murmuring wings the pauſing gale,
And rural echoes talk along the vale;
Dim hills behind in pomp aerial riſe,
Lift their blue tops, and melt into the ſkies. 170

The varied landſcape, l. 160. The pleaſure we feel on examining a fine landſcape, is derived from various ſources; as firſt the excitement of the retina of the eye into certain quantities of action; which when there is in the optic nerve any accumulation of ſenſorial power, is always agreeable. 2. When it is excited into ſuch ſucceſſive actions, as relieve each other; as when a limb has been long exerted in one direction, by ſtretching it in another; as deſcribed in Zoonomia, Sect. XL. 6. on ocular ſpectra. 3. And laſtly by the aſſociations of its parts with ſome agreeable ſentiments, or taſtes, as of ſublimity, beauty, utility,

"So when by HANDEL tuned to meaſured ſounds
The trumpet vibrates, or the drum rebounds;
Alarm'd we liſten with ecſtatic wonder
To mimic battles, or imagined thunder.
When the ſoft lute in ſweet impaſſion'd ſtrains
Of cruel nymphs or broken vows complains;
As on the breeze the fine vibration floats,
We drink delighted the melodious notes.

novelty; and the objects ſuggeſting other ſentiments, which have lately been termed picturеſque, as mentioned in the note on Canto III, l. 230 of this work. The two former of theſe ſources of pleaſure ariſe from irritation, the laſt from aſſociation.

We drink delighted, l. 178. The pleaſure we experience from muſic, is like that from viewing a landſcape, derived from various ſources; as firſt from the excitement of the auditory nerve into certain quantities of action, when there exiſts any accumulation of ſenſorial power. 2. When the auditory nerve is exerted in ſuch ſucceſſive actions as relieve each other, like ſtretching or yawning, as deſcribed in Botanic Garden, Vol. II, Interlude the third, theſe ſucceſſions of ſound are termed melody, and the combinations harmony. 3. From the repetition of ſounds at certain intervals of time; as we hear them with greater facility and accuracy, when we expect them;

But when young Beauty on the realms above
Bends her bright eye, and thrills the tones of
love; 180
Seraphic ſounds enchant this nether ſphere;
And liſtening angels lean from Heaven to hear.

"Next by SENSATION led, new joys commence
From the fine movements of the excited ſenſe;
In ſwarms ideal urge their airy flight,
Adorn the day-ſcenes, and illume the night.
Her ſpells o'er all the hand of Fancy flings,
Gives form and ſubſtance to unreal things;
With fruits and foliage decks the barren waſte,
And brightens Life with ſentiment and taſte; 190

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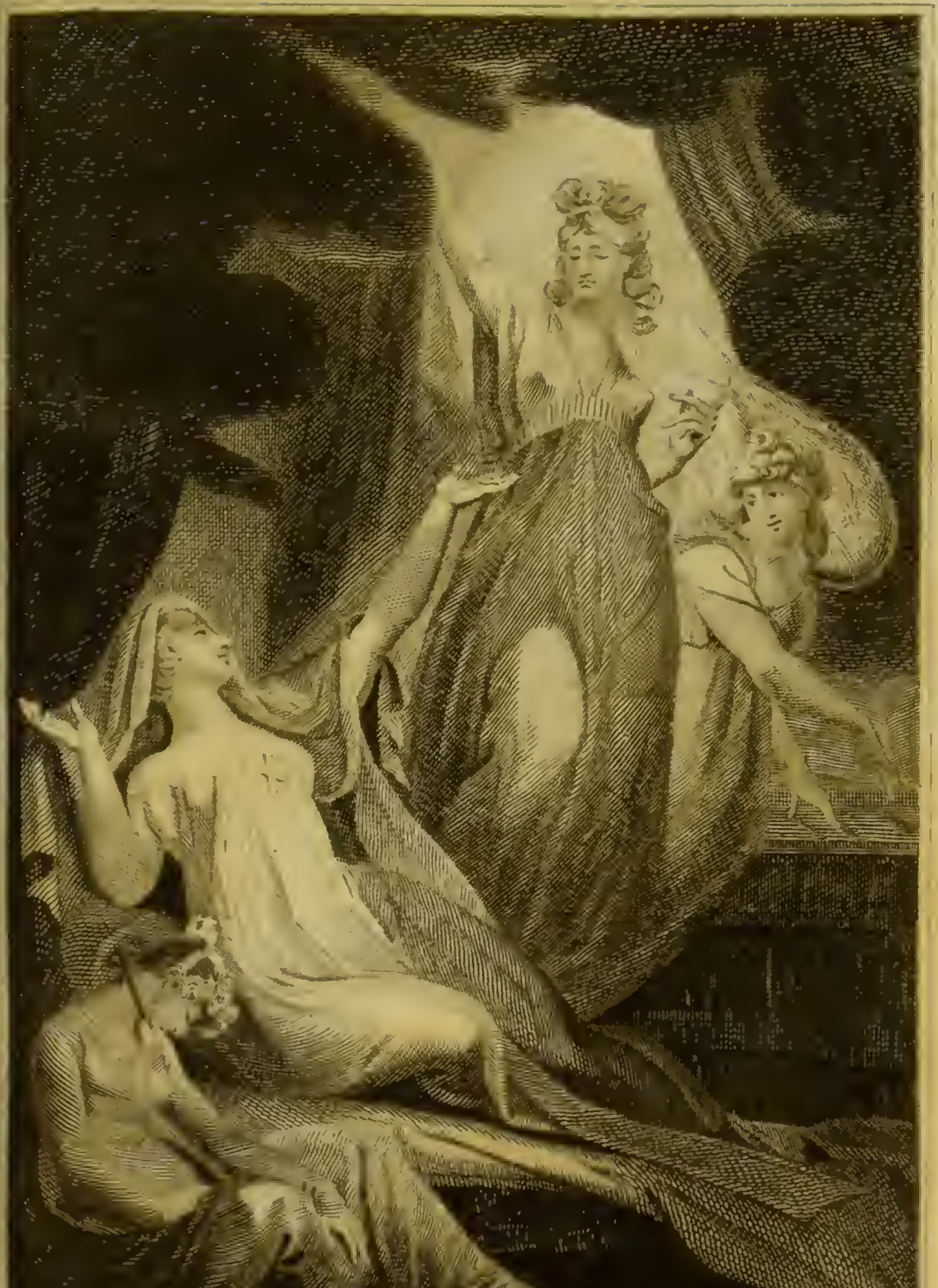
becauſe they are then excited by volition, as well as by irritation, or at leaſt the tympanum is then better adapted to aſſiſt their production; hence the two muſical times or bars; and hence the rhimes in poetry give pleaſure, as well as the meaſure of the verſe; and laſtly the pleaſure we receive from muſic, ariſes from the aſſociations of agreeable ſentiments with certain proportions, or repetitions, or quantities, or times of ſounds which have been previouſly acquired; as explained in Zoonomia Vol. I. Sect. XVI. 10. and Sect. XXII. 2.

Pleaſed o'er the level and the rule preſides,
The painter's bruſh, the ſculptor's chiſſel guides,
With ray ethereal lights the poet's fire,
Tunes the rude pipe, or ſtrings the heroic lyre:
Charm'd round the nymph on frolic footſteps move
The angelic forms of Beauty, Grace, and Love.

"So dreams the Patriot, who indignant draws
The ſword of vengeance in his Country's cauſe;
Bright for his brows unfading honours bloom,
Or kneeling Virgins weep around his tomb. 200
So holy tranſports in the cloiſter's ſhade
Play round thy toilet, viſionary maid!
Charm'd o'er thy bed celeſtial voices ſing,
And Seraphs hover on enamour'd wing.

"So Howard, Moira, Burdett, ſought the cells,
Where want, or woe, or guilt in darkneſs dwells;
With Pity's torch illumed the dread domains,
Wiped the wet eye, and eaſed the galling chains;



H Fuseli Esq.r R.A inv.t

A. Dadlo sculp.t

The power of Fancy in Dreams.

London Publish'd May 1.1807 by J. Johnson S.t Pauls Church Yard.

With Hope's bright bluſhes warm'd the midnight
air,
And drove from earth the Demon of Deſpair. 210
Erewhile emerging from the caves of night
The Friends of Man aſcended into light;
With ſoft aſſuaſive eloquence addreſs'd
The ear of Power to ſtay his ſtern beheſt;
At Mercy's call to ſtretch his arm and ſave
His tottering victims from the gaping grave.
Theſe with ſweet ſmiles Imagination greets,
For theſe ſhe opens all her treaſured ſweets,
Strews round their couch, by Pity's hand combined,
Bright flowers of joy, the ſunſhine of the mind; 220
While Fame's loud trump with ſounds applauſive
breathes
And Virtue crowns them with immortal wreathes.

"Thy acts, VOLITION, to the world impart
The plans of Science with the works of art;
Give to proud Reaſon her comparing power,
Warm every clime, and brighten every hour.

In Life's firſt cradle, ere the dawn began
Of young Society to poliſh man;
The ſtaff that propp'd him, and the bow that arm'd,
The boat that bore him, and the ſhed that warm'd,
Fire, raiment, food, the ploughſhare, and the ſword,
Aroſe, Volition, at thy plaſtic word.

"By thee inſtructed, Newton's eye ſublime
Mark'd the bright periods of revolving time;
Explored in Nature's ſcenes the effect and cauſe,
And, charm'd, unravell'd all her latent laws.
Delighted Herschel with reflected light
Purſues his radiant journey through the night;
Detects new guards, that roll their orbs afar
In lucid ringlets round the Georgian ſtar.

"Inſpired by thee, with ſcientific wand
Pleaſed Archimedes mark'd the figured ſand;

Mark'd the figured ſand, l. 242. The ancient orators ſeem to have ſpoken diſreſpectfully of the mechanic philoſophers.

Seized with mechanic graſp the approaching decks,
And ſhook the aſſailants from the inverted wrecks.
—Then cried the Sage, with grand effects elate,
And proud to ſave the Syracuſian ſtate;
While crowds exulting ſhout their noiſy mirth,
'Give where to ſtand, and I will move the earth.'
So Savery, guided his exploſive ſteam
In iron cells to raiſe the balanced beam; 250
The Giant-form its ponderous maſs uprears,
Deſcending nods and ſeems to ſhake the ſpheres.

"Led by Volition on the banks of Nile
Where bloom'd the waving flax on Delta's iſle,

Cicero mentioning Archimedes, calls him Homunculus e pulvere et radio, alluding to the cuſtom of drawing problems on the ſand with a ſtaff.

So Savery guided, l. 249. Captain Savery firſt applied the preſſure of the atmoſphere to raiſe water in conſequence of a vacuum previouſly produced by the condenſation of ſteam, though the Marquis of Worceſter had before propoſed to uſe for this purpoſe the expanſive power of ſteam; ſee Botanic Garden, Vol. I. Canto I. l. 253. Note.

The waving flax, l. 254. Flax is ſaid to have been firſt

Pleaſed Isis taught the fibrous ſtems to bind,
And part with hammers from the adheſive rind;
With locks of flax to deck the diſtaff-pole,
And whirl with graceful bend the dancing ſpole.
In level lines the length of woof to ſpread,
And dart the ſhuttle through the parting thread. 260
So Arkwright taught from Cotton-pods to cull,
And ſtretch in lines the vegetable wool;
With teeth of ſteel its fibre-knots unfurl'd,
And with the ſilver tiſſue clothed the world.

" Ages remote by thee, Volition, taught
Chain'd down in characters the winged thought;
With ſilent language mark'd the letter'd ground,
And gave to ſight the evaneſcent ſound.

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diſcovered on the banks of the Nile, and Iſis to have been the inventreſs of ſpinning and weaving.

So Arkwright taught, l. 261. See Botanic Garden, Vol. II. Canto II. l. 87, Note.

Now, happier lot! enlighten'd realms poſſeſs
The learned labours of the immortal Preſs; 270
Nurſed on whoſe lap the births of ſcience thrive,
And riſing Arts the wrecks of Time ſurvive.

"Ye patriot heroes! in the glorious cauſe
Of Juſtice, Mercy, Liberty, and Laws,
Who call to Virtue's ſhrine the Britiſh youth,
And ſhake the ſenate with the voice of Truth;
Rouſe the dull ear, the hoodwink'd eye unbind,
And give to energy the public mind;

The immortal Preſs, l. 270. The diſcovery of the art of printing has had ſo great influence on human affairs, that from thence may be dated a new æra in the hiſtory of mankind. As by the diffuſion of general knowledge, both of the arts of taſte and of uſeful ſciences, the public mind has become improved to ſo great a degree, that though new impoſitions have been perpetually produced, the arts of detecting them have improved with greater rapidity. Hence ſince the introduction of printing, ſuperſtition has been much leſſened by the reformation of religion; and necromancy, aſtrology, chiromancy, witchcraft, and vampyriſm, have vaniſhed from all claſſes of ſociety; though

While rival realms with blood unſated wage
Wide-waſting war with fell demoniac rage; 280
In every clime while army army meets,
And oceans groan beneath contending fleets;
Oh ſave, oh ſave, in this eventful hour
The tree of knowledge from the axe of power;
With foſtering peace the ſuffering nations bleſs,
And guard the freedom of the immortal Preſs!
So ſhall your deathleſs fame from age to age
Survive recorded in the hiſtoric page;
And future bards with voice inſpired prolong
Your ſacred names immortalized in ſong. 290

"Thy power, ASSOCIATION, next affords
Ideal trains annex'd to volant words,

ſome are ſtill ſo weak in the preſent enlightened times as to believe in the prodigies of animal magnetiſm, and of metallic tractors; by this general diffuſion of knowledge, if the liberty of the preſs be preſerved, mankind will not be liable in this part of the world to ſink into ſuch abject ſlavery as exiſts at this day in China.

Conveys to liſtening ears the thought ſuperb,
And gives to Language her expreſſive verb;
Which in one changeful ſound ſuggeſts the fact
At once to be, to ſuffer, or to act;
And marks on rapid wing o'er every clime
The viewleſs flight of evaneſcent Time.

"Call'd by thy voice contiguous thoughts embrace
In endleſs ſtreams arranged by Time or Place; 300

Her expreſſive verb, l. 294. The verb, or the word, has been ſo called from its being the moſt expreſſive term in all languages, as it ſuggeſts the ideas of exiſtence, action or ſuffering, and of time; ſee the Note on Canto III. l. 371, of this work.

Call'd by thy voice, l. 299. The numerous trains of aſſociated ideas are divided by Mr. Hume into three claſſes, which he has termed contiguity, cauſation, and reſemblance. Nor ſhould we wonder to find them thus connected together, ſince it is the buſineſs of our lives to diſpoſe them into theſe three claſſes; and we become valuable to ourſelves and our friends as we ſucceed in it. Thoſe who have combined an extenſive claſs of ideas by the contiguity of time or place, are men learned in the hiſtory of mankind, and of the ſciences they have cultivated. Thoſe who have connected a great claſs of ideas of reſemblances, poſſeſs the

The Muſe hiſtoric hence in every age
Gives to the world her *intereſting* page;
While in bright landſcape from her moving pen,
Riſe the fine tints of manners and of men.

"Call'd by thy voice Reſemblance next deſcribes
Her ſiſter-thoughts in lucid trains or tribes;
Whence pleaſed Imagination oft combines
By looſe analogies her fair deſigns;
Each winning grace of poliſh'd wit beſtows
To deck the Nymphs of Poetry and Proſe. 310

ſource of the ornaments of poetry and oratory, and of all rational analogy. While thoſe who have connected great claſſes of ideas of cauſation, are furniſhed with the powers of producing effects. Theſe are the men of active wiſdom who lead armies to victory, and kingdoms to proſperity; or diſcover and improve the ſciences which meliorate and adorn the condition of humanity.

Poliſh'd wit beſtows, l. 309. Mr. Locke defines wit to conſiſt of an aſſemblage of ideas, brought together with quickneſs and variety, wherein can be found any reſemblance or congruity, thereby to make up pleaſant pictures and agreeable viſions in the fancy. To which Mr. Addiſon adds, that theſe muſt occaſion

"Laſt, at thy potent nod, Effect and Cauſe
Walk hand in hand accordant to thy laws;
Riſe at Volition's call, in groups combined,
Amuſe, delight, inſtruct, and ſerve Mankind;
Bid raiſed in air the ponderous ſtructure ſtand,
Or pour obedient rivers through the land;
With cars unnumber'd crowd the living ſtreets,
Or people oceans with triumphant fleets.

"Thy magic touch imagined forms ſupplies
From colour'd light, the language of the eyes; 320
On Memory's page departed hours inſcribes,
Sweet ſcenes of youth, and Pleaſure's vaniſh'd tribes.

ſurpriſe as well as delight; Spectator, Vol. I. No. LXII. See Note on Canto III. l. 145. and Additional Note VII. 3. Perhaps wit in the extended uſe of the word may mean to expreſs all kinds of fine writing, as the word Taſte is applied to all agreeable viſible objects, and thus wit may mean deſcriptive ſublimity, beauty, the pathetic, or ridiculous, but when uſed in the confined ſenſe, as by Mr. Locke and Mr. Addiſon as above, it may probably be better defined a combination of ideas with agreeable novelty, as this may be effected by oppoſition as well as by reſemblance.

By thee Antinous leads the dance ſublime
On wavy ſtep, and moves in meaſured time;
Charm'd round the Youth ſucceſſive Graces throng,
And Eaſe conducts him, as he moves along;
Unbreathing crowds the floating form admire,
And Veſtal boſoms feel forbidden fire.

“When rapp'd Cecilia breathes her matin vow,
And lifts to Heaven her fair adoring brow;
From her ſweet lips, and riſing boſom part
Impaſſion'd notes, that thrill the melting heart;
Tuned by thy hand the dulcet harp ſhe rings,
And ſounds reſponſive echo from the ſtrings;
Bright ſcenes of bliſs in trains ſuggeſted move,
And charm the world with melody and love.

III. “Soon the fair forms with vital being bleſs'd
Time's feeble children, loſe the boon poſſeſs'd;
The goaded fibre ceaſes to obey,
And ſenſe deſerts the uncontractile clay;

The goaded fibre, l. 339. Old age conſiſts in the inaptitude to

While births unnumber'd, ere the parents die,
The hourly waſte of lovely life ſupply;
And thus, alternating with death, fulfil
The ſilent mandates of the Almighty Will;
Whoſe hand unſeen the works of nature dooms
By laws unknown—WHO GIVES, AND WHO RESUMES.

"Each pregnant Oak ten thouſand acorns forms
Profuſely ſcatter'd by autumnal ſtorms;
Ten thouſand ſeeds each pregnant poppy ſheds
Profuſely ſcatter'd from its waving heads; 350

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motion from the inirritability of the ſyſtem, and the conſequent want of fibrous contraction; ſee Additional Note VII.

Ten thouſand ſeeds, l. 349. The fertility of plants in reſpect to ſeeds is often remarkable; from one root in one ſummer the ſeeds of zea, maize, amount to 2000; of inula, elecampane, to 3000; of helianthus, ſunflower, to 4000; of papaver, poppy, 32000; of nicotiana, tobacco, to 40300; to this muſt be added the perennial roots, and the buds. Buds, which are ſo many herbs, in one tree, the trunk of which does not exceed a ſpan in thickneſs, frequently amount to 10000; Lin. Phil. Bot. p. 86.

The countleſs Aphides, prolific tribe,
With greedy trunks the honey'd ſap imbibe;

The countleſs Aphides, l. 351. The aphiſes, pucerons, or vine fretters, are hatched from an egg in the early ſpring, and are all called females, as they produce a living offspring about once in a fortnight to the ninth generation, which are alſo all of them females; then males are alſo produced, and by their intercourſe the females become oviparous, and depoſit their eggs on the branches, or in the bark, to be hatched in the enſuing ſpring.

This double mode of reproduction, ſo exactly reſembling the buds and ſeeds of trees, accounts for the wonderful increaſe of this inſect, which according to Dr. Richardſon, conſiſts of ten generations, and of fifty at an average in each generation; ſo that the ſum of fifty multiplied by fifty, and that product again multiplied by fifty-nine times would give the product of one egg only in countleſs millions; to which muſt be added the innumerable eggs laid by the tenth generation for the renovation of their progeny in the enſuing ſpring.

The honey'd ſap, l. 352. The aphis punctures with its fine proboſcis the ſap-veſſels of vegetables without any viſible wound, and thus drinks the ſap juice, or vegetable chyle, as it aſcends. Hence on the twigs of trees they ſtand with their heads downwards, as I have obſerved, to acquire this aſcending ſap-juice with greater facility. The honey dew on the upper ſurface of leaves is evacuated by theſe inſects, as they hang on the underſide

Swarm on each leaf with eggs or embryons big,
And pendent nations tenant every twig.
Amorous with double ſex, the ſnail and worm,
Scoop'd in the ſoil, their cradling caverns form;
Heap their white eggs, ſecure from froſt and floods,
And crowd their nurſeries with uncounted broods.
Ere yet with wavy tail the tadpole ſwims,
Breathes with new lungs, or tries his naſcent limbs; 360

of the leaves above; when they take too much of this ſaccharine juice during the vernal or midſummer ſap-flow of moſt vegetables; the black powder on leaves is alſo their excrement at other times. The vegetable world ſeems to have eſcaped total deſtruction from this inſect by the number of flies, which in their larva ſtate prey upon them; and by the ichneumon fly, which depoſits its eggs in them. Some vegetables put forth ſtiff briſtles with points round their young ſhoots, as the moſs-roſe, apparently to prevent the depredation of theſe inſects, ſo injurious to them by robbing them of their chyle or nouriſhment.

The tadpole ſwims, l. 359. The progreſs of a tadpole from a fiſh to a quadruped by his gradually putting forth his limbs, and at length leaving the water, and breathing the dry air, is a ſubject of great curioſity, as it reſembles ſo much the incipient ſtate

Her countleſs ſhoals the amphibious frog forſakes,
And living iſlands float upon the lakes.
The migrant herring ſteers her myriad bands
From ſeas of ice to viſit warmer ſtrands;
Unfathom'd depths and climes unknown explores,
And covers with her ſpawn unmeaſured ſhores.
—All theſe, increaſing by ſucceſſive birth,
Would each o'erpeople ocean, air, and earth.

" So human progenies, if unreſtrain'd,
By climate friended, and by food ſuſtain'd, 370
O'er ſeas and ſoils, prolific hordes! would ſpread
Erelong, and deluge their terraqueous bed;
But war, and peſtilence, diſeaſe, and dearth,
Sweep the ſuperfluous myriads from the earth.
Thus while new forms reviving tribes acquire
Each paſſing moment, as the old expire;
Like inſects ſwarming in the noontide bower,
Riſe into being, and exiſt an hour;

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of all other quadrupeds, and men who are aquatic animals in the uterus, and become aerial ones at their birth.

The births and deaths contend with equal ſtriſe,
And every pore of Nature teems with Life; 380
Which buds or breathes from Indus to the Poles,
And Earth's vaſt ſurface kindles, as it rolls!

" HENCE when a Monarch or a muſhroom dies,
Awhile extinct the organic matter lies;
But, as a few ſhort hours or years revolve,
Alchemic powers the changing maſs diſſolve;
Born to new life unnumber'd inſects pant,
New buds ſurround the microſcopic plant;
Whoſe embryon ſenſes, and unwearied frames,
Feel finer goads, and bluſh with purer flames; 390

Which buds or breathes, l. 381. Organic bodies, beſides the carbon, hydrogen, azote, and the oxygen and heat, which are combined with them, require to be alſo immerſed in looſe heat and looſe oxygen to preſerve their mutable exiſtence; and hence life only exiſts on or near the ſurface of the earth; ſee Botan. Garden, Vol. I. Canto IV. l. 419. L'organization, le ſentiment, le movement ſpontané, la vie, n'exiſtent qu'à la ſurface de la terre, et dans les lieux expoſés à la lumiére. Traité de Chimie par M. Lavoiſier, Tom. I. p. 202.

Born to new life, l. 387. From the innumerable births of

Renaſcent joys from irritation ſpring,
Stretch the long root, or wave the aurelian wing.

" When thus a ſquadron or an army yields,
And feſtering carnage loads the waves or fields;
When few from famines or from plagues ſurvive,
Or earthquakes ſwallow half a realm alive;—
While Nature ſinks in Time's deſtructive ſtorms,
The wrecks of Death are but a change of forms;
Emerging matter from the grave returns,
Feels new deſires, with new ſenſations burns; 400
With youth's firſt bloom a finer ſenſe acquires,
And Loves and Pleaſures fan the riſing fires.—

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the larger inſects and the ſpontaneous productions of the microſcopic ones, every part of organic matter from the recrements of dead vegetable or animal bodies, on or near the ſurface of the earth, becomes again preſently reanimated; which by increaſing the number and quantity of living organizations, though many of them exiſt but for a ſhort time, adds to the ſum total of terreſtrial happineſs.

Thus ſainted PAUL, 'O Death!' exulting cries,
'Where is thy ſting? O Grave! thy victories?'

Immortal Happineſs from realms deceaſed
Wakes, as from ſleep, unleſſen'd or increaſed;
Calls to the wiſe in accents loud and clear,
Sooths with ſweet tones the ſympathetic ear;
Informs and fires the reviveſcent clay,
And lights the dawn of Life's returning day. 410

"So when Arabia's Bird, by age oppreſs'd,
Conſumes delighted on his ſpicy neſt;

Thus ſainted Paul, l. 403. The doctrine of St. Paul teaches the reſurrection of the body in an incorruptible and glorified ſtate, with conſciouſneſs of its previous exiſtence; he therefore juſtly exults over the ſting of death, and the victory of the grave.

And lights the dawn, l. 410. The ſum total of the happineſs of organized nature is probably increaſed rather than diminiſhed, when one large old animal dies, and is converted into many thouſand young ones; which are produced or ſupported with their numerous progeny by the ſame organic matter. Linnæus aſſerts, that three of the flies, called muſca vomitoria, will conſume the body of a dead horſe, as ſoon as a lion can; Syſt. Nat.

So when Arabia's bird, l. 411. The ſtory of the Phœnix

A filial Phœnix from his aſhes ſprings,
Crown'd with a ſtar, on renovated wings;
Aſcends exulting from his funeral flame,
And ſoars and ſhines, another and the ſame.

"So erſt the Sage with ſcientific truth
In Grecian temples taught the attentive youth;
With ceaſeleſs change how reſtleſs atoms paſs
From life to life, a tranſmigrating maſs; 420
How the ſame organs, which to day compoſe
The poiſonous henbane, or the fragrant roſe,

riſing from its own aſhes with a ſtar upon its head ſeems to have been an hieroglyphic emblem of the deſtruction and reſuſcitation of all things; ſee Botan. Garden, Vol. I. Canto IV. l. 389.

So erſt the Sage, l. 417. It is probable, that the perpetual tranſmigration of matter from one body to another, of all vegetables and animals, during their lives, as well as after their deaths, was obſerved by Pythagoras; which he afterwards applied to the ſoul, or ſpirit of animation, and taught, that it paſſed from one animal to another as a puniſhment for evil deeds, though without conſciouſneſs of its previous exiſtence; and from this doctrine he inculcated a ſyſtem of morality and benevolence, as all creatures thus became related to each other.

May with to morrow's ſun new forms compile,
Frown in the Hero, in the Beauty ſmile.
Whence drew the enlighten'd Sage the moral plan,
That man ſhould ever be the friend of man;
Should eye with tenderneſs all living forms,
His brother-emmets, and his ſiſter-worms.

"HEAR, O ye Sons of Time! your final doom,
And read the characters, that mark your tomb: 430
The marble mountain, and the ſparry ſteep,
Were built by myriad nations of the deep,—

The marble mountain, l. 431. From the increaſed knowledge in Geology during the preſent century, owing to the greater attention of philoſophers to the ſituations of the different materials, which compoſe the ſtrata of the earth, as well as to their chemical properties, it ſeems clearly to appear, that the nucleus of the globe beneath the ocean conſiſted of granite; and that on this the great beds of lime-ſtone were formed from the ſhells of marine animals during the innumerable primeval ages of the world; and that whatever ſtrata lie on theſe beds of lime-ſtone, or on the granite where the lime-ſtone does not cover it, were formed after the elevation of iſlands and continents above the ſurface of the ſea by the recrements of vegetables and of terreſtrial animals; ſee on this ſubject Botanic Garden, Vol. I. Additional Note XXIV.

Age after age, who form'd their ſpiral ſhells,
Their ſea-fan gardens and their coral cells;
Till central fires with unextinguiſhed ſway
Raiſed the primeval iſlands into day;—
The ſand-fill'd ſtrata ſtretch'd from pole to pole;
Unmeaſured beds of clay, and marl, and coal,
Black ore of manganeſe, the zinky ſtone,
And duſky ſteel on his magnetic throne,
In deep moraſs, or eminence ſuperb,
Roſe from the wrecks of animal or herb;
Theſe from their elements by Life combined,
Form'd by digeſtion, and in glands refined,
Gave by their juſt excitement of the ſenſe
The Bliſs of Being to the vital Ens.

"Thus the tall mountains, that emboſs the lands,
Huge iſles of rock, and continents of ſands,
Whoſe dim extent eludes the inquiring ſight,
ARE MIGHTY MONUMENTS OF PAST DELIGHT;

Are mighty monuments, l. 450. The reader is referred to a

Shout round the globe, how Reproduction ſtrives
With vanquiſh'd Death,—and Happineſs ſurvives;
How Life increaſing peoples every clime,
And young renaſcent Nature conquers Time;
—And high in golden characters record
The immenſe munificence of NATURE'S LORD!—

few pages on this ſubject in Phytologia, Sect. XIX. 7. 1, where the felicity of organic life is conſidered more at large; but it is probable that the moſt certain way to eſtimate the happineſs and miſery of organic beings; as it depends on the actions of the organs of ſenſe, which conſtitute ideas; or of the muſcular fibres which perform locomotion; would be to conſider thoſe actions, as they are produced or excited by the four ſenſorial powers of irritation, ſenſation, volition, and aſſociation. A ſmall volume on this ſubject by ſome ingenious writer, might not only amuſe, as an object of curioſity; but by ſhowing the world the immediate ſources of their pains and pleaſures might teach the means to avoid the one, and to procure the other, and thus contribute both ways to increaſe the ſum total of organic happineſs.

How Life increaſing, l. 453. Not only the vaſt calcareous provinces, which form ſo great a part of the terraqueous globe, and alſo whatever reſts upon them as clay, marl, ſand, and coal, were formed from the fluid elements of heat, oxygen, azote, and

"He gives and guides the ſun's attractive force,
And ſteers the planets in their ſilver courſe;

hydrogen along with carbon, phoſphorus, and perhaps a few other ſubſtances, which the ſcience of chemiſtry has not yet decompoſed; and gave the pleaſure of life to the animals and vegetables, which formed them; and thus conſtitute monuments of the paſt happineſs of thoſe organized beings. But as thoſe remains of former life are not again totally decompoſed, or converted into their original elements, they ſupply more copious food to the ſucceſſion of new animal or vegetable beings on their ſurface; which conſiſts of materials convertible into nutriment with leſs labour or activity of the digeſtive powers; and hence the quantity or number of organized bodies, and their improvement in ſize, as well as their happineſs, has been continually increaſing, along with the ſolid parts of the globe; and will probably continue to increaſe, till the whole terraqueous ſphere, and all that inhabit it ſhall diſſolve by a general conflagration, and be again reduced to their elements.

Thus all the ſuns, and the planets, which circle round them, may again ſink into one central chaos; and may again by exploſions produce a new world; which in proceſs of time may reſemble the preſent one, and at length again undergo the ſame cataſtrophe! theſe great events may be the reſult of the immutable laws impreſſed on matter by the Great Cauſe of Cauſes, Parent of Parents, Ens Entium!

With heat and light revives the golden day,
And breathes his ſpirit on organic clay; 460
With hand unſeen directs the general cauſe
By firm immutable immortal laws."

Charm'd with her words the Muſe aſtoniſh'd
ſtands,
The Nymphs enraptured claſp their velvet hands;
Applauſive thunder from the fane recoils,
And holy echoes peal along the aiſles;
O'er NATURE's ſhrine celeſtial luſtres glow,
And lambent glories circle round her brow.

IV. Now ſinks the golden ſun,—the veſper ſong
Demands the tribute of URANIA's tongue; 470
Onward ſhe ſteps, her fair aſſociates calls
From leaf-wove avenues, and vaulted halls.
Fair virgin trains in bright proceſſion move,
Trail their long robes, and whiten all the grove;
Pair after pair to Nature's temple ſweep,
Thread the broad arch, aſcend the winding ſteep;

Through brazen gates along ſuſurrant aiſles
Stream round their GODDESS the ſucceſſive files;
Curve above curve to golden ſeats retire,
And ſtar with beauty the refulgent quire.

AND firſt to HEAVEN the conſecrated throng
With chant alternate pour the adoring ſong,
Swell the full hymn, now high, and now profound,
With ſweet reſponſive ſymphony of ſound.
Seen through their wiry harps, below, above,
Nods the fair brow, the twinkling fingers move;
Soft-warbling flutes the ruby lip commands,
And cymbals ring with high uplifted hands.

TO CHAOS next the notes melodious paſs,
How ſuns exploded from the kindling maſs,

To Chaos next. l. 489.

> Namque canebat uti magnum per inane coacta
> Semina terrarumque, animæque, mariſque fuiſſent;
> Et liquidi ſimul ignis; ut his exordia primis
> Omnia, et ipſe tener mundi concreverit orbis.
>
> VIRG. EC. VI. l. 31.

Waved o'er the vaſt inane their treſſes bright,
And charm'd young Nature's opening eyes with
light.
Next from each ſun how ſpheres reluctant burſt,
And ſecond planets iſſued from the firſt.
And then to EARTH deſcends the moral ſtrain,
How iſles, emerging from the ſhoreleſs main,
With ſparkling ſtreams and fruitful groves began,
And form'd a Paradiſe for mortal man.

Sublimer notes record CELESTIAL LOVE,
And high rewards in brighter climes above; 500
How Virtue's beams with mental charm engage
Youth's raptured eye, and warm the froſt of age,
Gild with ſoft luſtre Death's tremendous gloom,
And light the dreary chambers of the tomb.
How fell Remorſe ſhall ſtrike with venom'd dart,
Though mail'd in adamant, the guilty heart;
Fierce furies drag to pains and realms unknown
The blood-ſtain'd tyrant from his tottering throne.

By hands unſeen are ſtruck aerial wires,
And Angel-tongues are heard amid the quires; 510
From aiſle to aiſle the trembling concord floats,
And the wide roof returns the mingled notes,
Through each fine nerve the keen vibrations dart,
Pierce the charm'd ear, and thrill the echoing heart.—

MUTE the ſweet voice, and ſtill the quivering ſtrings,
Now Silence hovers on unmoving wings.—
—Slow to the altar fair URANIA bends
Her graceful march, the ſacred ſteps aſcends,
High in the midſt with blazing cenſer ſtands,
And ſcatters incenſe with illumined hands: 520
Thrice to the GODDESS bows with ſolemn pauſe,
With trembling awe the myſtic veil withdraws,
And, meekly kneeling on the gorgeous ſhrine,
Lifts her ecſtatic eyes to TRUTH DIVINE! 524

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ADDITIONAL NOTES.

NOTE I.—SPONTANEOUS VITALITY OF MICROSCOPIC ANIMALS.

Hence without parent by ſpontaneous birth
Riſe the firſt ſpecks of animated earth.
Canto I. l. 227.

PREJUDICES AGAINST THIS DOCTRINE.

I. From the miſconception of the ignorant or ſuperſtitious, it has been thought ſomewhat profane to ſpeak in favour of ſpontaneous vital production, as if it contradicted holy writ; which ſays, that God created animals and vegetables. They do not recollect that God created all things which exiſt, and that theſe have been from the beginning in a perpetual ſtate of improvement; which appears from the globe itſelf, as well as from the animals and vegetables, which poſſeſs it. And laſtly, that there is more dignity in our idea of the ſupreme author of all things, when we conceive him to be the cauſe of cauſes, than the cauſe ſimply of the events, which we ſee, if there can be any difference in infinity of power!

Another prejudice which has prevailed againſt the ſpontaneous production of vitality, ſeems to have ariſen from the miſrepreſentation of this doctrine, as if the larger animals had been thus produced; as Ovid ſuppoſes after the deluge of Deucalion, that lions were ſeen riſing out of the mud of the Nile, and ſtruggling to diſentangle their hinder parts. It was not conſidered, that animals and vegetables have been perpetually improving by reproduction; and that ſpontaneous vitality was only to be looked for in the ſimpleſt organic beings, as in the ſmalleſt microſcopic animalcules; which perpetually, perhaps hourly, enlarge themſelves by reproduction, like the roots of tulips from ſeed, or the buds of ſeedling trees, which die annually, leaving others by ſolitary reproduction rather more perfect than themſelves for many ſucceſſive years, till at length they acquire ſexual organs or flowers.

A third prejudice againſt the exiſtence of ſpontaneous vital productions has been the ſuppoſed want of analogy; this has alſo ariſen from the expectation, that the larger or more complicated animals ſhould be thus produced; which have acquired their preſent perfection by ſucceſſive generations during an uncounted ſeries of ages. Add to this, that the want of analogy oppoſes the credibility of all new diſcoveries, as of the magnetic needle, and coated electric jar, and Galvanic pile; which ſhould therefore certainly be well weighed and nicely inveſtigated before diſtinct credence is given them; but then the want of analogy muſt at length yield to repeated ocular demonſtration.

PRELIMINARY OBSERVATIONS.

II. Concerning the ſpontaneous production of the ſmalleſt microſcopic animals it ſhould be firſt obſerved, that the power of reproduction diſtinguiſhes organic being, whether vegetable or animal, from inanimate nature. The circulation of fluids in veſſels may exiſt in hydraulic machines, but the power of reproduction belongs alone to life. This reproduction of plants and of animals is of two kinds, which may be termed ſolitary and ſexual. The former of theſe, as in the reproduction of the buds of trees, and of the bulbs of tulips, and of the polypus, and aphis, appears to be the firſt or moſt ſimple mode of generation, as many of theſe organic beings afterwards acquire ſexual organs, as the flowers of ſeedling trees, and of ſeedling tulips, and the autumnal progeny of the aphis. See Phytologia.

Secondly, it ſhould be obſerved, that by reproduction organic beings are gradually enlarged and improved; which may perhaps more rapidly and uniformly occur in the ſimpleſt modes of animated being; but occaſionally alſo in the more complicated and perfect kinds. Thus the buds of a ſeedling tree, or the bulbs of ſeedling tulips, become larger and ſtronger in the ſecond year than the firſt, and thus improve till they acquire flowers or ſexes; and the aphis, I believe, increaſes in bulk to the eighth or ninth generation, and then produces a ſexual progeny. Hence the exiſtence of ſpontaneous vitality is only to be expected to be found in the ſimpleſt modes of animation, as the complex ones have been formed by many ſucceſſive reproductions.

EXPERIMENTAL FACTS.

III. By the experiments of Buffon, Reaumur, Ellis, Ingenhouz, and others, microſcopic animals are produced in three or four days, according to the warmth of the ſeaſon, in the infuſions of all vegetable or animal matter. One or more of theſe gentlemen put ſome boiling veal broth into a phial previouſly heated in the fire, and ſealing it up hermetically or with melted wax, obſerved it to be replete with animalcules in three or four days.

Theſe microſcopic animals are believed to poſſeſs a power of generating others like themſelves by ſolitary reproduction without ſex; and theſe gradually enlarging and improving for innumerable ſucceſſive generations. Mr Ellis in Phil. Tranſact. V. LIX. gives drawings of ſix kinds of animalcula infuſoria, which increaſe by dividing acroſs the middle into two diſtinct animals. Thus in paſte compoſed of flour and water, which has been ſuffered to become aceſcent, the animalcules called eels, vibrio anguillula, are ſeen in great abundance; their motions are rapid and ſtrong; they are viviparous, and produce at intervals a numerous progeny: animals ſimilar to theſe are alſo found in vinegar: Naturaliſt's Miſcellany by Shaw and Nodder, Vol. II. Theſe ells were probably at firſt as minute as other microſcopic animalcules; but by frequent, perhaps hourly reproduction, have gradually become the large animals above deſcribed, poſſeſſing wonderful ſtrength and activity.

To ſuppoſe the eggs of the former microſcopic animals to float in the atmoſphere, and paſs through the ſealed glaſs phial, is ſo contrary to apparent nature, as to be totally incredible! and as the latter are viviparous, it is equally abſurd to ſuppoſe, that their parents float univerſally in the atmoſphere to lay their young in paſte or vinegar!

Not only microſcopic animals appear to be produced by a ſpontaneous vital proceſs, and then quickly improve by ſolitary generation like the buds of trees, or like the polypus and aphis, but there is one vegetable body, which appears to be produced by a ſpontaneous vital proceſs, and is believed to be propagated and enlarged in ſo ſhort a time by ſolitary generation as to become viſible to the naked eye; I mean the green matter firſt attended to by Dr. Prieſtley, and called by him conferva fontinalis. The proofs, that this material is a vegetable, are from its giving up ſo much oxygen, when expoſed to the ſunſhine, as it grows in water, and from its green colour.

Dr. Ingenhouz aſſerts, that by filling a bottle with well-water, and inverting it immediately into a baſin of well-water, this green vegetable is formed in great quantity; and he believes, that the water itſelf, or ſome ſubſtance contained in the water, is converted into this kind of vegetation, which then quickly propagates itſelf.

M. Girtanner aſſerts, that this green vegetable matter is not produced by water and heat alone, but requires the ſun's light for this purpoſe, as he obſerved by many experiments, and thinks it ariſes from decompoſing water deprived of a part of its oxygen, and laughs at Dr. Prieſtley for believing that the ſeeds of this conferva, and the parents of microſcopic animals, exiſt univerſally in the atmoſphere, and penetrate the ſides of glaſs jars; Philoſ. Magazine for May 1800.

Beſides this green vegetable matter of Dr. Prieſtley, there is another vegetable, the minute beginnings of the growth of which Mr. Ellis obſerved by his microſcope near the ſurface of all putrefying vegetable or animal matter, which is the mucor or mouldineſs; the vegetation of which was amazingly quick ſo as to be almoſt ſeen, and ſoon became ſo large as to be viſible to the naked eye. It is difficult to conceive how the ſeeds of this mucor can float ſo univerſally in the atmoſphere as to fix itſelf on all putrid matter in all places.

THEORY OF SPONTANEOUS VITALITY.

IV. In animal nutrition the organic matter of the bodies of dead animals, or vegetables, is taken into the ſtomach, and there ſuffers decompoſitions and new combinations by a chemical proceſs. Some parts of it are however abſorbed by the lacteals as faſt as they are produced by this proceſs of digeſtion; in which circumſtance this proceſs differs from common chemical operations.

In vegetable nutrition the organic matter of dead animals, or vegetables, undergoes chemical decompoſitions and new combinations on or beneath the ſurface of the earth; and parts of it, as they are produced, are perpetually abſorbed by the roots of the plants in contact with it; in which this alſo differs from common chemical proceſſes.

Hence the particles which are produced from dead organic matter by chemical decompoſitions or new conſequent combinations, are found proper for the purpoſes of nutrition of living vegetable and animal bodies, whether theſe decompoſitions and new combinations are performed in the ſtomach or beneath the ſoil.

For the purpoſes of nutrition theſe digeſted or decompoſed recrements of dead animal or vegetable matter are abſorbed by the lacteals of the ſtomachs of animals or of the roots of vegetables, and carried into the circulation of their blood, and theſe compoſe new organic parts to replace others which are deſtroyed, or to increaſe the growth of the plant or animal.

It is probable, that as in inanimate or chemical combinations, one of the compoſing materials muſt poſſeſs a power of attraction, and the other an aptitude to be attracted; ſo in organic or animated compoſitions there muſt be particles with appetencies to unite, and other particles with propenſities to be united with them.

Thus in the generation of the buds of trees, it is probable that two kinds of vegetable matter, as they are ſeparated from the ſolid ſyſtem, and float in the circulation, become arreſted by two kinds of vegetable glands, and are then depoſed beneath the cuticle of the tree, and there join together forming a new vegetable, the caudex of which extends from the plumula at the ſummit to the radicles beneath the ſoil, and conſtitutes a ſingle fibre of the bark.

Theſe particles appear to be of two kinds; one of them poſſeſſing an appetency to unite with the other, and the latter a propenſity to be united with the former; and they are probably ſeparated from the vegetable blood by two kinds of glands, one repreſenting thoſe of the anthers, and the others thoſe of the ſtigmas, in the ſexual organs of vegetables; which is ſpoken of at large in Phytologia, Sect. VII. and in Zoonomia, Vol. I. Sect. XXXIX. 8. of the third edition, in octavo; where it is likewiſe ſhown, that none of theſe parts which are depoſited beneath the cuticle of the tree, is in itſelf a complete vegetable embryon, but that they form one by their reciprocal conjunction.

So in the ſexual reproduction of animals, certain parts ſeparated from the living organs, and floating in the blood, are arreſted by the ſexual glands of the female, and others by thoſe of the male. Of theſe none are complete embryon animals, but form an embryon by their reciprocal conjunction.

There hence appears to be an analogy between generation and nutrition, as one is the production of new organization, and the other the reſtoration of that which previouſly exiſted; and which may therefore be ſuppoſed to require materials ſomewhat ſimilar. Now the food taken up by animal lacteals is previouſly prepared by the chemical proceſs of digeſtion in the ſtomach; but that which is taken up by vegetable lacteals, is prepared by chemical diſſolution of organic matter beneath the ſurface of the earth. Thus the particles, which form generated animal embryons, are prepared from dead organic matter by the chemico-animal proceſſes of ſanguification and of ſecretion; while thoſe which form ſpontaneous microſcopic animals or microſcopic vegetables are prepared by chemical diſſolutions and new combinations of organic matter in watery fluids with ſufficient warmth.

It may be here added, that the production and properties of ſome kinds of inanimate matter, are almoſt as difficult to comprehend as thoſe of the ſimpleſt degrees of animation. Thus the elaſtic gum or caoutchouc, and ſome foſſile bitumens, when drawn out to a great length, contract themſelves by their elaſticity, like an animal fibre by ſtimulus. The laws of action of theſe, and all other elaſtic bodies, are not yet underſtood; as the laws of the attraction of coheſion, to produce theſe effects, muſt be very different from thoſe of general attraction, ſince the farther the particles of elaſtic bodies are drawn from each other till they ſeparate, the ſtronger they ſeem to attract; and the nearer they are preſſed together, the more they ſeem to repel; as in bending a ſpring, or in extending a piece of elaſtic gum; which is the reverſe to what occurs in the attractions of diſunited bodies; and much wants further inveſtigation. So the ſpontaneous production of alcohol or of vinegar, by the vinous and acetous fermentations, as well as the production of a mucus by putrefaction which will contract when extended, ſeems almoſt as difficult to underſtand as the ſpontaneous production of a fibre from decompoſing animal or vegetable ſubſtances, which will contract when ſtimulated, and thus conſtitutes the primordium of life.

Some of the microſcopic animals are ſaid to remain dead for many days or weeks, when the fluid in which they exiſted is dried up, and quickly to recover life and motion by the freſh addition of water and warmth. Thus the chaos redivivum of Linnæus dwells in vinegar and in bookbinders paſte; it revives by water after having been dried for years, and is both oviparous and viviparous; Syſt. Nat. Thus the vorticella or wheel animal, which is found in rain water that has ſtood ſome days in leaden gutters, or in hollows of lead on the tops of houſes, or in the ſlime or ſediment left by ſuch water, though it diſcovers no ſign of life except when in the water, yet it is capable of continuing alive for many months though kept in a dry ſtate. In this ſtate it is of a globulous ſhape, exceeds not the bigneſs of a grain of ſand, and no ſigns of life appear; but being put into water, in the ſpace of half an hour a languid motion begins, the globule turns itſelf about, lengthens itſelf by ſlow degrees, aſſumes the form of a lively maggot, and moſt commonly in a few minutes afterwards puts out its wheels, ſwimming vigorouſly through the water as if in ſearch of food; or elſe, fixing itſelf by the tail, works the wheels in ſuch a manner as to bring its food to its mouth; Engliſh Encyclopedia, Art. Animalcule.

Thus ſome ſhell-ſnails in the cabinets of the curious have been kept in a dry ſtate for ten years or longer, and have revived on being moiſtened with warmiſh water; Philoſ. Tranſact. So eggs and ſeeds, after many months torpor, are revived by warmth and moiſture; hence it may be concluded, that even the organic particles of dead animals may, when expoſed to a due degree of warmth and moiſture, regain ſome degree of vitality, ſince this is done by more complicate animal organs in the inſtances above mentioned.

The hydra of Linnæus, which dwells in the rivers of Europe under acquatic plants, has been obſerved by the curious of the preſent time, to revive after it has been dried, to be reſtored after being mutilated, to multiply by being divided, to be propagated from ſmall portions, to live after being inverted; all which would be beſt explained by the doctrine of ſpontaneous reproduction from organic particles not yet completely decompoſed.

To this ſhould be added, that theſe microſcopic animals are found in all ſolutions of vegetable or animal matter in water; as black pepper ſteeped in water, hay ſuffered to become putrid in water, and the water of dunghills, afford animalcules in aſtoniſhing numbers. See Mr. Ellis's curious account of Animalcules produced from an infuſion of Potatoes and Hempſeed; Philoſ. Tranſact. Vol. LIX, from all which it would appear, that organic particles of dead vegetables and animals, during their uſual chemical changes into putridity or acidity, do not loſe all their organization or vitality, but retain ſo much of it as to unite with the parts of living animals in the proceſs of nutrition, or unite and produce new complicate animals by ſecretion as in generation, or produce very ſimple microſcopic animals or microſcopic vegetables, by their new combinations in warmth and moiſture.

And finally, that theſe microſcopic organic bodies are multiplied and enlarged by ſolitary reproduction without ſexual intercourſe till they acquire greater perfection or new properties. Lewenhoek obſerved in rain-water which had ſtood a few days the ſmalleſt ſcarcely viſible microſcopic animalcules, and in a few more days he obſerved others eight times as large; Engliſh Encyclop. Art. Animalcule.

CONCLUSION.

There is therefore no abſurdity in believing that the moſt ſimple animals and vegetables may be produced by the congreſs of the parts of decompoſing organic matter, without what can properly be termed generation, as the genus did not previouſly exiſt; which accounts for the endleſs varieties, as well as for the immenſe numbers of microſcopic animals.

The green vegetable matter of Dr. Prieſtley, which is univerſally produced in ſtagnant water, and the mucor, or mouldineſs, which is ſeen on the ſurface of all putrid vegetable and animal matter, have probably no parents, but a ſpontaneous origin from the congreſs of the decompoſing organic particles, and afterwards propagate themſelves. Some other fungi, as thoſe growing in cloſe wine-vaults, or others which ariſe from decaying trees, or rotten timber, may perhaps be owing to a ſimilar ſpontaneous production, and not previouſly exiſt as perfect organic beings in the juices of the wood, as ſome have ſuppoſed. In the ſame manner it would ſeem that the common eſculent muſhroom is produced from horſe dung at any time and in any place, as is the common practice of many gardeners; Kennedy on Gardening.

APPENDIX.

The knowledge of microſcopic animals is ſtill in its infancy: thoſe already known are arranged by Mr. Muller into the following claſſes; but it is probable, that many more claſſes, as well as innumerable individuals, may be diſcovered by improvements of the microſcope, as Mr. Herſchell has diſcovered ſo many thouſand ſtars, which were before inviſible, by improvements of the teleſcope.

Mr. Muller's claſſes conſiſt of

I. Such as have no External Organs.

1. Monas: Punctiformis. A mere point.
2. Proteus: Mutabilis. Mutable.
3. Volvox: Sphæricum. Spherical.
4. Enchelis: Cylindracea. Cylindrical.
5. Vibrio: Elongatum. Long.

* Membranaceous.

6. Cyclidium: Ovale. Oval.
7. Paramecium: Oblongum. Oblong.

8. Kolpoda: Sinuatum. Sinuous.
9. Gonium: Angulatum. With angles.
10. Burſaria. Hollow like a purſe.

II. Thoſe that have External Organs.

* Naked, or not encloſed in a ſhell.

1. Cercaria: Caudatum. With a tail.
2. Trichoda: Crinitum. Hairy.
3. Kerona: Corniculatum. With horns.
4. Himantopus: Cirratum. Cirrated.
5. Leucophra: Ciliatum undique. Every part ciliated.
6. Vorticella: Ciliatum apice. The apex ciliated.

* Covered with a ſhell.

7. Brachionus: Ciliatum apice. The apex ciliated.

1. Theſe animalcules are diſcovered in two or three days in all decompoſitions of organic matter, whether vegetable or animal, in moderate degrees of warmth with ſufficient moiſture.

2. They appear to enlarge in a few days, and ſome to change their form; which are probably converted from more ſimple into more complicate animalcules by repeated reproductions. See Note VIII.

3. In their early ſtate they ſeem to multiply by viviparous ſolitary reproduction, either by external diviſion, as the ſmaller ones, or by an internal progeny, as the eels in paſte or vinegar; and laſtly, in

their more mature ſtate, the larger ones are ſaid to appear to have ſexual connexion. Engl. Encyclop.

4. Thoſe animalcules diſcovered in puſtules of the itch, in the feces of dyſenteric patients, and in ſemine maſculino, I ſuppoſe to be produced by the ſtagnation and incipient decompoſition of thoſe materials in their receptacles, and not to exiſt in the living blood or recent ſecretions; as none, I believe have been diſcovered in blood when firſt drawn from the arm, or in fluids newly ſecreted from the glands, which have not previouſly ſtagnated in their reſervoirs.

5. They are obſerved to move in all directions with eaſe and rapidity, and to avoid obſtacles, and not to interfere with each other in their motions. When the water is in part evaporated, they are ſeen to flock towards the remaining part, and ſhow great agitation. They ſuſtain a great degree of cold, as ſome inſects, and periſh in much the ſame degree of heat as deſtroys inſects; all which evince that they are living animals.

And it is probable, that other or ſimilar animalcules may be produced in the air, or near the ſurface of the earth, but it is not ſo eaſy to view them as in water; which as it is tranſparent, the creatures produced in it can eaſily be obſerved by applying a drop to a microſcope. I hope that microſcopic reſearches may again excite the attention of philoſophers, as unforeſeen advantages may probably be derived from them, like the diſcovery of a new world.

NOTE II.

THE FACULTIES OF THE SENSORIUM.

Next the long nerves unite their ſilver train,
And young Senſation permeates the brain.
Canto I. l. 250.

I. The fibres, which conſtitute the muſcles and organs of ſenſe, poſſeſs a power of contraction. The circumſtances attending the exertion of this power of contraction conſtitute the laws of animal motion, as the circumſtances attending the exertion of the power of attraction conſtitute the laws of motion of inanimate matter.

II. The ſpirit of animation is the immediate cauſe of the contraction of animal fibres, it reſides in the brain and nerves, and is liable to general or partial diminution or accumulation.

III. The ſtimulus of bodies external to the moving organ is the remote cauſe of the original contractions of animal fibres.

IV. A certain quantity of ſtimulus produces irritation, which is an exertion of the ſpirit of animation exciting the fibres into contraction.

V. A certain quantity of contraction of animal fibres, if it be perceived at all, produces pleaſure; a greater or leſs quantity of contraction, if it be perceived at all, produces pain; theſe conſtitute ſenſation.

VI. A certain quantity of ſenſation produces deſire or averſion; theſe conſtitute volition.

VII. All animal motions which have occurred at the ſame time, or in immediate ſucceſſion, become ſo connected, that when one of them is reproduced, the other has a tendency to accompany or ſucceed it. When fibrous contractions ſucceed or accompany other fibrous contractions, the connexion is termed aſſociation; when fibrous contractions ſucceed ſenſorial motions, the connexion is termed cauſation; when fibrous and ſenſorial motions reciprocally introduce each other, it is termed catenation of animal motions.

VIII. Theſe four faculties of the ſenſorium during their inactive ſtate are termed irritability, ſenſibility, voluntarity, and aſſociability; in their active ſtate they are termed as above irritation, ſenſation, volition, aſſociation.

Irritation is an exertion or change of ſome extreme part of the ſenſorium reſiding in the muſcles or organs of ſenſe, in conſequence of the appulſes of external bodies.

Senſation is an exertion or change of the central parts of the ſenſorium, or of the whole of it, beginning at ſome of thoſe extreme parts of it, which reſide in the muſcles or organs of ſenſe.

Volition is an exertion or change of the central parts of the ſenſorium, or of the whole of it, terminating in ſome of thoſe extreme parts of it, which reſide in the muſcles or organs of ſenſe.

Aſſociation is an exertion or change of ſome extreme part of the ſenſorium reſiding in the muſcles or organs of ſenſe, in conſequence of ſome antecedent or attendant fibrous contractions; ſee Zoonomia, Vol. I.

The word ſenſorium is uſed to expreſs not only the medullary part of the brain, ſpinal marrow, nerves, organs of ſenſe and muſcles, but alſo at the ſame time that living principle, or ſpirit of animation, which reſides throughout the body, without being cognizable to our ſenſes except by its effects.

NOTE III.—VOLCANIC FIRES.

Next when impriſon'd fires in central caves
Burſt the firm earth, and drank the headlong waves.
CANTO I. l. 202.

THE great and repeated exploſions of volcanoes are ſhown by Mr. Mitchell in the Philoſoph. Tranſact. to ariſe from their communication with the ſea, or with rivers, or inundations; and that after a chink or crack is made, the water ruſhing into an immenſe burning cavern, and falling on boiling lava, is inſtantly expanded into ſteam, and produces irreſiſtible exploſions.

As the firſt volcanic fires had no previous vent, and were probably more central, and larger in quantity, before they burſt the cruſt of the earth then intire, and as the ſea covered the whole, it muſt rapidly ſink down into every opening chink; whence theſe primeval earthquakes were of much greater extent, and of much greater force than thoſe which occur in the preſent era.

It ſhould be added, that there may be other elaſtic vapours produced by great heat from whatever will evaporate, as mercury, and even diamonds; which may be more elaſtic, and conſequently exert greater force than the ſteam of water, even though heated red hot. Which may thence exert a ſufficient power to raiſe iſlands and continents, and even to throw the moon from the earth.

If the moon be ſuppoſed to have been thus thrown out of the great cavity which now contains the South Sea, the immenſe quantity of water flowing in from the primeval ocean, which then covered the earth, would much contribute to leave the continents and iſlands, which might be raiſed at the ſame time above the ſurface of the water. In later days there are accounts of large ſtones falling from the ſky, which may have been thus thrown by exploſion from ſome diſtant earthquake, without ſufficient force to cauſe them to circulate round the earth, and thus produce numerous ſmall moons or ſatellites.

Mr. Mitchell obſerves, that the agitations of the earth from the great earthquake at Liſbon were felt

[illegible] There is no [illegible] of [illegible] or
a volcano until its outbreak [illegible]
[illegible]

in this country about the ſame time after the ſhock as ſound would have taken in paſſing from Liſbon hither; and thence aſcribes theſe agitations to the vibrations of the ſolid earth, and not to ſubterraneous caverns of communication; Philoſ. Tranſact. But from the exiſtence of warm ſprings at Bath and Buxton, there muſt certainly be unceaſing ſubterraneous fires at ſome great depth beneath thoſe parts of this iſland; ſee on this ſubject Botanic Garden, Vol. II. Canto IV. l. 79, note. For an account of the noxious vapours emitted from volcanoes, ſee Botanic Garden, Vol. II. Cant. IV. l. 328, note. For the milder effects of central fires, ſee Botanic Garden, Vol. I. Cant. I. l. 139, and Additional Note VI.

NOTE IV.—MUSQUITO.

So from deep lakes the dread Muſquito ſprings,
Drinks the ſoft breeze, and dries his tender wings.
Canto I. l. 327.

The gnat, or muſquito, culex pipiens. The larva of this inſect lives chiefly in water, and the pupa moves with great agility. It is fiſhed for by ducks; and, when it becomes a fly, is the food of the young of partridges, quails, ſparrows, ſwallows, and other ſmall birds. The females wound us, and leave a red point; and in India their bite is more venemous.

The male has its antennæ and feelers feathered, and ſeldom bites or ſucks blood; Lin. Syſt. Nat.

It may be driven away by ſmoke, eſpecially by that from inula helenium, elecampane; and by that of cannabis, hemp. Kalm. It is ſaid that a light in a chamber will prevent their attack on ſleeping perſons.

The gnats of this country are produced in greater numbers in ſome years than others, and are then ſeen in ſwarms for many evenings near the lakes or rivers whence they ariſe; and, I ſuppoſe, emigrate to upland ſituations, where fewer of them are produced. About thirty years ago ſuch a ſwarm was obſerved by Mr. Whitehurſt for a day or two about the lofty tower of Derby church, as to give a ſuſpicion of the fabric being on fire.

Many other kinds of flies have their origin in the water, as perhaps the whole claſs of neuroptera. Thus the libellula, dragon fly: the larva of which hurries amid the water, and is the cruel crocodile of aquatic inſects. After they become flies, they prey principally on the claſs of inſects termed lepidoptera and diptera of Linnæus. The ephemera is another of this order, which riſes from the lakes in ſuch quantities in ſome countries, that the ruſtics have carried cart-loads of them to manure their corn lands; the larva ſwims in the water: in its fly-ſtate the pleaſures of life are of ſhort duration, as its marriage, production of its progeny, and funeral, are often celebrated in one day. The phryganea is another fly of this order; the larva lies concealed under the water in moveable cylindrical tubes of their own making. In the fly-ſtate they inſtitute evening dances in the air in ſwarms, and are fiſhed for by the ſwallows.

Many other flies, who do not leave their eggs in water, contrive to lay them in moiſt places, as the oeſtros bovis, the larvæ of which exiſt in the bodies of cattle, where they are nouriſhed during the winter, and are occaſionally extracted by a bird of the crow-kind called buphaga. Theſe larvæ are alſo found in the ſtomachs of horſes, whom they ſometimes deſtroy; another ſpecies of them adhere to the anus of horſes, and creep into the loweſt bowel, and are called botts; and another ſpecies enters the frontal ſinus of ſheep, occaſioning a vertigo called the turn. The muſca pendula lives in ſtagnant water; the larva is ſuſpended by a thread-form reſpiratory tube; of the muſca chamæleon, the larva lives in fountains, and the fly occaſionally walks upon the water. The muſca vomitoria is produced in carcaſſes; three of theſe flies conſume the dead body of a horſe as ſoon as a lion. Lin. Syſt. Nat.

NOTE V.—AMPHIBIOUS ANIMALS.

So ſtill the Diodons, amphibious tribe,
With twofold lungs the ſea and air imbibe.
CANT. I. l. 331.

D. D. GARDEN diſſected the amphibious creature called diodon by Linnæus, and was amazed to find that it poſſeſſed both external gills and internal lungs, which he deſcribed and prepared and ſent to Linnæus; who thence put this animal into the order nantes of his claſs amphibia. He adds alſo, in his account of polymorpha before the claſs amphibia, that ſome of this claſs breathe by lungs only, and others by both lungs and gills.

Some amphibious quadrupeds, as the beaver, water rat, and otter, are ſaid to have the foramen ovale of the heart open, which communicates from one cavity of it to the other; and that, during their continuance under water, the blood can thus for a time circulate without paſſing through the lungs; but as it cannot by theſe means acquire oxygen either from the air or water, theſe creatures find it frequently neceſſary to riſe to the ſurface to reſpire. As this foramen ovale is always open in the fœtus of quadrupeds, till after its birth that it begins to reſpire, it has been propoſed by ſome to keep young puppies three or four times a day for a minute or two under warm water to prevent this communication from one cavity of the heart to the other from growing up; whence it has been thought ſuch dogs might become amphibious. It is alſo believed that this circumſtance has exiſted in ſome divers for pearl; whoſe children are ſaid to have been thus kept under water in their early infancy to enable them afterwards to ſucceed in their employment.

But the moſt frequent diſtinction of the amphibious animals, that live much in the water, is, that their heart conſiſts but of one cell; and as they are pale creatures with but little blood, and that colder and darker coloured, as frogs and lizards, they require leſs oxygen than the warmer animals with a greater quantity and more ſcarlet blood; and thence, though they have only lungs, they can ſtay long under water without great inconvenience; but are all of them, like frogs, and crocodiles, and whales, neceſſitated frequently to riſe above the ſurface for air.

In this circumſtance of their poſſeſſing a one-celled heart, and colder and darker blood, they approach to the ſtate of fiſh; which thus appear not to acquire ſo much oxygen by their gills from the water as terreſtrial animals do by their lungs from the atmoſphere; whence it may be concluded that the gills of fiſh do not decompoſe the water which paſſes through them, and which contains ſo much more oxygen than the air, but that they only procure a ſmall quantity of oxygen from the air which is diffuſed in the water; which alſo is further confirmed by an experiment with the air-pump, as fiſh ſoon die when put in a glaſs of water into the exhauſted receiver, which they would not do if their gills had power to decompoſe the water and obtain the oxygen from it.

The lamprey, petromyzon, is put by Linnæus amongſt the nantes, which are defined to poſſeſs both gills and lungs. It has ſeven ſpiracula, or breathing holes, on each ſide of the neck, and by its more perfect lungs approaches to the ſerpent kind; Syſt. Nat. The means by which it adheres to ſtones, even in rapid ſtreams, is probably owing to a partial vacuum made by its reſpiring organs like ſucking, and may be compared to the ingenious method by which boys are ſeen to lift large ſtones in the ſtreet, by applying to them a piece of ſtrong moiſt leather with a ſtring through the centre of it; which, when it is forcibly drawn upwards, produces a partial vacuum under it, and thus the ſtone is ſupported by the preſſure of the atmoſphere.

The leech, hirudo, and the remora, echeneis, adhere ſtrongly to objects probably by a ſimilar method. I once ſaw ten or twelve leeches adhere to each foot of an old horſe a little above his hoofs, who was grazing in a moraſs, and which did not loſe their hold when he moved about. The bare-legged travellers in Ceylon are ſaid to be much infeſted by leeches; and the ſea-leech, hirudo muricata, is ſaid to adhere to fiſh, and the remora is ſaid to adhere to ſhips in ſuch numbers as to retard their progreſs.

The reſpiratory organ of the whale, I ſuppoſe, is pulmonary in part, as he is obliged to come frequently to the ſurface, whence he can be purſued after he is ſtruck with the harpoon; and may nevertheleſs be in part like the gills of other fiſh, as he ſeems to draw in water when he is below the ſurface, and emits it again when he riſes above it.

NOTE VI.—HIEROGLYPHIC CHARACTERS.

So erſt as Egypt's rude deſigns explain.
CANTO I. l. 351.

The outlines of animal bodies, which gave names to the conſtellations, as well as the characters uſed in chemiſtry for the metals, and in aſtronomy for the planets, were originally hieroglyphic figures, uſed by the magi of Egypt before the invention of letters, to record their diſcoveries in thoſe ſciences.

Other hieroglyphic figures ſeem to have been deſigned to perpetuate the events of hiſtory, the diſcoveries in other arts, and the opinions of thoſe ancient philoſophers on other ſubjects. Thus their figures of Venus for beauty, Minerva for wiſdom, Mars and Bellona for war, Hercules for ſtrength, and many others, became afterwards the deities of of Greece and Rome; and together with the figures of Time, Death, and Fame, conſtitute the language of the painters to this day.

From the ſimilarity of the characters which deſignate the metals in chemiſtry, and the planets in aſtronomy, it may be concluded that theſe parts of ſcience were then believed to be connected; whence aſtrology ſeems to have been a very early ſuperſtition. Theſe, ſo far, conſtitute an univerſal viſible language in thoſe ſciences.

So the glory, or halo, round the head is a part of the univerſal language of the eye, deſignating a holy perſon; wings on the ſhoulders denote a good angel; and a tail and hoof denote the figure of an evil demon; to which may be added the cap of liberty and the tiara of popedom. It is to be wiſhed that many other univerſal characters could be introduced into practice, which might either conſtitute a more comprehenſive language for painters, or for other arts; as thoſe of ciphers and ſigns have done for arithmetic and algebra, and crotchets for muſic, and the alphabets for articulate ſounds; ſo a zigzag line made on white paper by a black-lead pencil, which communicates with the ſurface of the mercury in the barometer, as the paper itſelf is made conſtantly to move laterally by a clock, and daily to deſcend through the ſpace neceſſary, has ingeniouſly produced a moſt accurate viſible account of the riſe and fall of the mercury in the barometer every hour in the year.

Mr. Grey's Memoria Technica was deſigned as an artificial language to remember numbers, as of the eras, or dates of hiſtory. This was done by ſubſtituting one conſonant and one vowel for each figure of the ten ciphers uſed in arithmetic, and by compoſing words of theſe letters; which words Mr. Grey makes into hexameter verſes, and produces an audible jargon, which is to be committed to memory, and occaſionally analyſed into numbers when required. An ingenious French botaniſt, Monſieur Bergeret, has propoſed to apply this idea of Mr. Grey to a botanical nomenclature, by making the name of each plant to conſiſt of letters, which, when analyſed, were to ſignify the number ofthe claſs, order, genus, and ſpecies, with a deſcription alſo of ſome particular part of the plant, which was deſigned to be both an audible and viſible language.

Biſhop Wilkins, in his elaborate "Eſſay towards a Real Character and a Philoſophical Language," has endeavoured to produce, with the greateſt ſimplicity, and accuracy, and conciſeneſs, an univerſal language both to be written and ſpoken, for the purpoſe of the communication of all our ideas with greater exactneſs and leſs labour than is done in common languages, as they are now ſpoken and written. But we have to lament that the progreſs of general ſcience is yet too limited both for his purpoſe, and for that even of a nomenclature for botany; and that the ſcience of grammar, and even the number and manner of the pronunciation of the letters of the alphabet, are not yet determined with ſuch accuracy as would be neceſſary to conſtitute Biſhop Wilkins's grand deſign of an univerſal language, which might facilitate the acquirement of knowledge, and thus add to the power and happineſs of mankind.

NOTE VII.—OLD AGE AND DEATH.

The age-worn fibres goaded to contract,
By repetition palſied, ceaſe to act.

CANTO II. l. 4.

I. EFFECTS OF AGE.

THE immediate cauſe of the infirmities of age, or of the progreſs of life to death, has not yet been well aſcertained. The anſwer to the queſtion, why animals become feeble and diſeaſed after a time, though nouriſhed with the ſame food which increaſed their growth from infancy, and afterwards ſupported them for many years in unimpaired health and ſtrength, muſt be ſought for from the laws of animal excitability, which, though at firſt increaſed, is afterwards diminiſhed by frequent repetitions of its adapted ſtimulus, and at length ceaſes to obey it.

1. There are four kinds of ſtimulus which induce the fibres to contract, which conſtitute the muſcles or the organs of ſenſe; as, firſt, The application of

external bodies, which excites into action the ſenſorial power of irritation; 2dly, Pleaſure and pain, which excite into action the ſenſorial power of ſenſation; 3dly, Deſire and averſion, which excite into action the power of volition; and laſtly, The fibrous contractions, which precede aſſociation, which is another ſenſorial power; ſee Zoonomia, Vol. I. Sect. II. 13.

Many of the motions of the organic ſyſtem, which are neceſſary to life, are excited by more than one of theſe ſtimuli at the ſame time, and ſome of them occaſionally by them all. Thus reſpiration is generally cauſed by the ſtimulus of blood in the lungs, or by the ſenſation of the want of oxygen; but is alſo occaſionally voluntary. The actions of the heart alſo, though generally owing to the ſtimulus of the blood, are alſo inflamed by the aſſociation of its motions with thoſe of the ſtomach, whence ſometimes ariſes an inequality of the pulſe, and with other parts of the ſyſtem, as with the capillaries, whence heat of the ſkin in fevers with a feeble pulſe: ſee Zoonomia. They are alſo occaſionally influenced by ſenſation, as is ſeen in the paleneſs occaſioned by fear, or the bluſh of ſhame and anger; and laſtly the motions of the heart are ſometimes aſſiſted by volition; thus in thoſe who are much weakened by fevers, the pulſe is liable to ſtop during their ſleep, and to induce great diſtreſs; which is owing at that time to the total ſuſpenſion of voluntary power; the ſame occurs during ſleep in ſome aſthmatic patients.

2. The debility of approaching age appears to be induced by the inactivity of many parts of the ſyſtem, or their diſobedience to their uſual kinds and quantities of ſtimulus: thus the pallid appearance of the ſkin of old age is owing to the inactivity of the heart, which ceaſes to obey the irritation cauſed by the ſtimulus of the blood, or its aſſociation with other moving organs with its former energy; whence the capillary arteries are not ſufficiently diſtended in their diaſtole, and conſequently contract by their elaſticity, ſo as to cloſe the canal, and their ſides gradually coaleſce. Of theſe, thoſe which are moſt diſtant from the heart, and of the ſmalleſt diameters, will ſooneſt cloſe, and become impervious; hence the hard pulſe of aged patients is occaſioned by the coaleſcence of the ſides of the vaſa vaſorum, or capillary arteries of the coats of the other arteries.

The veins of elderly people become turgid or diſtended with blood, and ſtand prominent on the ſkin; for as theſe do not poſſeſs the elaſticity of the arteries, they become diſtended with accumulation of blood; when the heart by its leſſened excitability does not contract ſufficiently forcibly, or frequently, to receive, as faſt as uſual, the returning blood; and their apparent prominence on the ſkin is occaſioned by the deficient ſecretion of fat or mucus in the cellular membrane; and alſo to the contraction and coaleſcence and conſequent leſs bulk, of many capillary arteries.

3. Not only the muſcular fibres loſe their degree of excitability from age, as in the above examples; and as may be obſerved in the tremulous hands and feeble ſtep of elderly perſons; but the organs of ſenſe become leſs excitable by the ſtimulus of external objects; whence the ſight and hearing become defective; the ſtimulus of the ſenſorial power of ſenſation alſo leſs affects the aged, who grieve leſs for the loſs of friends or for other diſappointments; it ſhould nevertheleſs be obſerved, that when the ſenſorial power of irritation is much exhauſted, or its production much diminiſhed; the ſenſorial power of ſenſation appears for a time to be increaſed;. as in intoxication there exiſts a kind of delirium and quick flow of ideas, and yet the perſon becomes ſo weak as to totter as he walks; but this delirium is owing to the defect of voluntary power to correct the ſtreams of ideas by intuitive analogy, as in dreams: ſee Zoonomia: and thus alſo thoſe who are enfeebled by habits of much vinous potation, or even by age alone, are liable to weep at ſhaking hands with a friend, whom they have not lately ſeen; which is owing to defect of voluntary power to correct their trains of ideas cauſed by ſenſation, and not to the increaſed quantity of ſenſation, as I formerly ſuppoſed.

The ſame want of voluntary power to keep the trains of ſenſitive ideas conſiſtent, and to compare them by intuitive analogy with the order of nature is the occaſion of the ſtarting at the clapping to of a door, or the fall of a key, which occaſions violent ſurpriſe with fear and ſometimes convulſions, in very feeble hyſterical patients, and is not owing I believe (as I formerly ſuppoſed) to increaſed ſenſation; as they are leſs ſenſible to ſmall ſtimuli than when in health.

Old people are leſs able alſo to perform the voluntary exertions of exerciſe or of reaſoning, and laſtly the aſſociation of their ideas becomes more imperfect, as they are forgetful of the names of perſons and places; the aſſociations of which are leſs permanent, than thoſe of the other words of a language, which are more frequently repeated.

4. This diſobedience of the fibres of age to their uſual ſtimuli, has generally been aſcribed to repetition or habit, as thoſe who live near a large clock, or a mill, or a waterfall, ſoon ceaſe to attend to the perpetual noiſe of it in the day, and ſleep during the night undiſturbed. Thus all medicines, if repeated too frequently, gradually loſe their effect; as wine and opium ceaſe to intoxicate: ſome diſagreeable taſtes, as tobacco, by frequent repetition ceaſe to be diſagreeable; grief and pain gradually diminiſh, and at length ceaſe altogether; and hence life itſelf becomes tolerable.

This diminiſhed power of contraction of the fibres of the muſcles or organs of ſenſe, which conſtitutes permanent debility or old age, may ariſe from a deficient ſecretion of ſenſorial power in the brain, as well as from the diſobedience of the muſcles and organs of ſenſe to their uſual ſtimuli ; but this leſs production of ſenſorial power muſt depend on the inactivity of the glands, which compoſe the brain, and are believed to ſeparate it perpetually from the blood ; and is thence owing to a ſimilar cauſe with the inaction of the fibres of the other parts of the ſyſtem.

It is finally eaſy to underſtand how the fibres may ceaſe to act by the uſual quantity of ſtimulus after having been previouſly expoſed to a greater quantity of ſtimulus, or to one too long continued; becauſe the expenditure of ſenſorial power has then been greater than its production; but it is not eaſy to explain why the repetition of fibrous contractions, which during the meridian of life did not expend the ſenſorial power faſter than it was produced ; or only in ſuch a degree as was daily reſtored by reſt and ſleep, ſhould at length in the advance of life expend too much of it ; or otherwiſe, that leſs of it ſhould be produced in the brain ; or reſide in the nerves ; laſtly that the fibres ſhould become leſs excitable by the uſual quantity of it.

5. But theſe facts would ſeem to ſhow, that all parts of the ſyſtem are not changed as we advance in life, as ſome have ſuppoſed ; as in that caſe it

might have preſerved for ever its excitability; and it might then perhaps have been eaſier for nature to have continued her animals and vegetables for ever in their mature ſtate, than perpetually by a complicate apparatus to have produced new ones, and ſuffer the old ones to periſh; for a further account of ſtimulus and the conſequent animal exertion, ſee Zoonomia, Vol. I. Sect. 12.

II. MEANS OF PREVENTING OLD AGE.

The means of preventing the approach of age muſt therefore conſiſt in preventing the inexcitability of the fibres, or the diminution of the production of ſenſorial power.

1. As animal motion cannot be performed without the fluid matter of heat, in which all things are immerſed, and without a ſufficient quantity of moiſture to prevent rigidity; nothing ſeems ſo well adapted to both theſe purpoſes as the uſe of the warm bath; and eſpecially in thoſe, who become thin or emaciated with age, and who have a hard and dry ſkin, with hardneſs of the coat of the arteries; which feels under the finger like a chord; the patient ſhould ſit in warm water for half an hour every day, or alternate days, or twice a week; the heat ſhould be about ninety-eight degrees on Fahrenheit's ſcale, or of ſuch a warmth as may be moſt agreeable to his ſenſation; but on leaving the bath he ſhould always be kept ſo cool, whether he

goes into bed, or continues up, as not ſenſibly to perſpire.

There is a popular prejudice, that the warm bath relaxes people, and that the cold bath braces them; which are mechanical terms belonging to drums and fiddle-ſtrings, but not applicable except metaphorically to animal bodies, and then commonly mean weakneſs and ſtrength; during the continuance in the bath the patient does not loſe weight, unleſs he goes in after a full meal, but generally weighs heavier as the abſorption is greater than the perſpiration; but if he ſuffers himſelf to ſweat on his leaving the bath, he will undoubtedly be weakened by the increaſed action of the ſyſtem, and its exhauſtion: the ſame occurs to thoſe who are heated by exerciſe, or by wine, or ſpice, but not during their continuance in the warm bath: whence we may conclude, that the warm bath is the moſt harmleſs of all thoſe ſtimuli, which are greater than our natural habits have accuſtomed us to; and that it particularly counteracts the approach of old age in emaciated people with dry ſkins.

It may be here obſerved in favour of bathing, that ſome fiſh are believed to continue to a great age, and continually to enlarge in ſize, as they advance in life; and that long after their ſtate of puberty. I have ſeen perch full of ſpawn, which were leſs than two inches long; and it is known, that they will grow to ſix or eight times that ſize;

it is ſaid, that the whales, which have been caught of late years, are much leſs in ſize than thoſe, which were caught, when firſt the whale-fiſhery was eſtabliſhed; as the large ones, which were ſuppoſed to have been ſome hundred years old, are believed to be already deſtroyed.

All cold-blooded amphibious animals more ſlowly waſte their ſenſorial power; as they are accuſtomed to leſs ſtimulus from their reſpiring leſs oxygen; and their movements in water are ſlower than thoſe of aerial animals from the greater reſiſtance of the element. There beſides ſeems to be no obſtacle to the growth of aquatic animals; as by means of the air-bladder, they can make their ſpecific gravity the ſame as that of the water in which they ſwim. And the moiſture of the element ſeems well adapted to counteract the rigidity of their fibres; and as their exertions in locomotion, and the preſſure of ſome parts on others, are ſo much leſs than in the bodies of land animals.

2. But as all exceſſive ſtimuli exhauſt the ſenſorial power, and render the ſyſtem leſs excitable for a time till the quantity of ſenſorial power is reſtored by ſleep, or by the diminution or abſence of ſtimulus; which is ſeen by the weakneſs of inebriates for a day at leaſt after intoxication; And as the frequent repetition of this great and unnatural ſtimulus of fermented liquors produces a permanent debility, or diſobedience of the ſyſtem to the uſual and natural kinds and quantities of ſtimulus, as occurs in

thoſe who have long been addicted to the ingurgitation of fermented liquors.

And as, ſecondly, the too great deficiency of the quantity of natural ſtimuli, as of food, and warmth, or of freſh air, produces alſo diſeaſes; as is often ſeen in the children of the poor in large towns, who become ſcrofulous from want of due nouriſhment, and from cold, damp, unairy lodgings.

The great and principal means to prevent the approach of old age and death, muſt conſiſt in the due management of the quantity of every kind of ſtimulus, but particularly of that from objects external to the moving organ; which may excite into action too great or too ſmall a quantity of the ſenſorial power of irritation, which principally actuates the vital organs. Whence the uſe of much wine, or opium, or ſpice, or of much ſalt, by their unnatural ſtimulus induces conſequent debility, and ſhortens life, on the one hand, by the exhauſtion of ſenſorial power; ſo on the other hand, the want of heat, food, and freſh air, induces debility from defect of ſtimulus, and a conſequent accumulation of ſenſorial power, and a general debility of the ſyſtem. Whence ariſe the pains of cold and hunger, and thoſe which are called nervous; and which are the cauſe of hyſteric, epileptic, and perhaps of aſthmatic paroxyſms, and of the cold fits of fever.

3. Though all exceſſes of increaſe and decreaſe of ſtimulus ſhould be avoided, yet a certain variation of ſtimulus ſeems to prolong the excitability of the

ſyſtem; as during any diminution of the uſual quantity of ſtimulus, an accumulation of ſenſorial power is produced: and in conſequence the excitability, which was leſſened by the action of habitual ſtimulus, becomes reſtored. Thus thoſe, who are uniformly habituated to much artificial heat, as in warm parlours in the winter months, loſe their irritability in ſome degree, and become feeble like hot-houſe plants; but by frequently going for a time into the cold air, the ſenſorial power of irritability is accumulated and they become ſtronger.

Whence it may be deduced, that the variations of the cold and heat of this climate contribute to ſtrengthen its inhabitants, who are more active and vigorous, and live longer, than thoſe of either much warmer or much colder latitudes.

This accumulation of ſenſorial power from diminution of ſtimulus any one may obſerve, who in ſevere weather may ſit by the fire-ſide till he is chill and uneaſy with the ſenſation of cold; but if he walks into the froſty air for a few minutes, an accumulation of ſenſorial power is produced by diminution of the ſtimulus of heat, and on his returning into the room where he was chill before, his whole ſkin will now glow with warmth.

Hence it may be concluded, that the variations of the quantity of ſtimuli within certain limits contribute to our health: and that thoſe houſes which are kept too uniformly warm, are leſs wholeſome than where the inhabitants are occaſionally expoſed to cold air in paſſing from one room to another.

Nevertheleſs to thoſe weak habits with pale ſkins and large pupils of the eyes, whoſe degree of irritability is leſs than health requires, as in ſcrofulous, hyſterical, and ſome conſumptive conſtitutions, a climate warmer than our own may be of ſervice, as a greater ſtimulus of heat may be wanted to excite their leſs irritability. And alſo a more uniform quantity of heat may be ſerviceable to conſumptive patients than is met with in this country, as the lungs cannot be clothed like the external ſkin, and are therefore ſubject to greater extremes of heat and cold in paſſing in winter from a warm room into the froſty air.

4. It ſhould nevertheleſs be obſerved, that there is one kind of ſtimulus, which, though it be employed in quantity beyond its uſual ſtate, ſeems to increaſe the production of ſenſorial power beyond the expenditure of it (unleſs its exceſs is great indeed) and thence to give permanent ſtrength and energy to the ſyſtem; I mean that of volition. This appears not only from the temporary ſtrength of angry or inſane people, but becauſe inſanity even cures ſome diſeaſes of debility, as I have ſeen in dropſy, and in ſome fevers: but it is alſo obſervable, that many who have exerted much voluntary effort during their whole lives, have continued active to great age. This however may be conceived to ariſe from theſe great exertions being per-

formed principally by the organs of ſenſe, that is by exciting and comparing ideas; as in thoſe who have invented ſciences, or have governed nations, and which did not therefore exhauſt the ſenſorial power of thoſe organs which are neceſſary to life, but perhaps rather prevented them from being ſooner impaired, their ſenſorial power not having been ſo frequently exhauſted by great activity; for very violent exerciſe of the body, long continued, forwards old age; as is ſeen in poſt-horſes that are cruelly treated, and in many of the poor, who with difficulty ſupport their families by inceſſant labour.

III. THEORY OF THE APPROACH OF AGE.

The critical reader is perhaps by this time become ſo far intereſted in this ſubject as to excuſe a more prolix elucidation of it.

In early life the repetition of animal actions occaſions them to be performed with greater facility, whether thoſe repetitions are produced by volition, ſenſation, or irritation; becauſe they ſoon become aſſociated together, if as much ſenſorial power is produced between every reiteration of action, as is expended by it.

But if a ſtimulus be repeated at uniform intervals of time, the action whether of our muſcles or organs of ſenſe, is performed with ſtill greater facility and energy; becauſe the ſenſorial power of aſſociation mentioned above, is combined with the ſenſorial power of irritation, and forms part of the diurnal chain of animal motions; that is, in common language, the acquired habit aſſiſts the power of the ſtimulus; ſee Zoonomia, Vol. I. Sect. XXII. 2, and Sect. XII. 3. 3.

On this circumſtance depends the eaſy motions of the fingers in performing muſic, and of the feet and arms in dancing and fencing, and of the hands in the uſe of tools in mechanic arts, as well as all the vital motions which animate and nouriſh organic bodies.

On the contrary, many animal motions by perpetual repetition are performed with leſs energy; as thoſe who live near a waterfall, or a ſmith's forge, after a time, ceaſe to hear them. And in thoſe infectious diſeaſes which are attended with fever, as the ſmall-pox and meaſles, violent motions of the ſyſtem are excited, which at length ceaſe, and cannot again be produced by application of the ſame ſtimulating material; as when thoſe are inoculated for the ſmall-pox, who have before undergone that malady. Hence the repetition, which occaſions animal actions for a time to be performed with greater energy, occaſions them at length to become feeble, or to ceaſe entirely.

To explain this difficult problem we muſt more minutely conſider the catenations of animal motions, as deſcribed in Zoonomia, Vol. I. Sect. XVII. The vital motions, as ſuppoſe of the heart and arterial ſyſtem, commence from the irritation occaſioned by the ſtimulus of the blood, and then have this irritation aſſiſted by the power of aſſociation; at the ſame time an agreeable ſenſation is produced by the due actions of the fibres, as in the ſecretions of the glands, which conſtitutes the pleaſure of exiſtence; this agreeable ſenſation is intermixed between every link of this diurnal chain of actions, and contributes to produce it by what is termed animal cauſation. But there is alſo a degree of the power of volition excited in conſequence of this vital pleaſure, which is alſo intermixed between the links of the chain of fibrous actions; and thus alſo contributes to its uniform eaſy and perpetual production.

The effects of ſurpriſe and novelty muſt now be conſidered by the patient reader, as they affect the catenations of action; and, I hope, the curioſity of the ſubject will excuſe the prolixity of this account of it. When any violent ſtimulus breaks the paſſing current or catenation of our ideas, ſurpriſe is produced, which is accompanied with pain or pleaſure, and conſequent volition to examine the object of it, as explained in Zoonomia, Vol. I. Sect. XVIII. 17, and which never affects us in ſleep. In our waking hours whenever an idea of imagination occurs, which is incongruous to our former experience, we feel another kind of ſurpriſe, and inſtantly diſſever the train of imagination by the power of volition, and compare the incongruous idea with our previous knowledge of nature, and reject it by an act of reaſoning, of which we are unconſcious, termed in Zoonomia, "Intuitive Analogy," Vol. I. Sect. XVII. 7.

The novelty of any idea, may be conſidered as affecting us with another kind of ſurpriſe, or incongruity, as it differs from the uſual train of our ideas, and forms a new link in this perpetual chain; which, as it thus differs from the ordinary courſe of nature, we inſtantly examine by the voluntary efforts of intuitive analogy; or by reaſoning, which we attend to; and compare it with the uſual appearances of nature.

Theſe ideas which affect us with ſurpriſe, or incongruity, or novelty, are attended with painful or pleaſureable ſenſation; which we mentioned before as intermixing with all catenations of animal actions, and contributing to ſtrengthen their perpetual and energetic production; and alſo exciting in ſome degree the power of volition, which alſo intermixes with the links of the chain of animal actions, and contributes to produce it.

Now by frequent repetition the ſurpriſe, incongruity or novelty ceaſes; and, in conſequence, the pleaſure or pain which accompanied it, and alſo the degree of volition which was excited by that ſenſation of pain or pleaſure; and thus the ſenſorial power of ſenſation and of volition are ſubducted from the catenation of vital actions, and they are in conſequence produced much weaker, and at length ceaſe entirely. Whence we learn why contagious matters induce their effects on the circulation but once; and why, in proceſs of time, the vital movements are performed with leſs energy, and at length ceaſe; whence the debilities of age, and conſequent death.

NOTE. VIII.—REPRODUCTION.

But Reproduction with ethereal fires
New life rekindles, ere the firſt expires.
CANTO II. l. 13.

I. THE reproduction or generation of living organized bodies, is the great criterion or characteriſtic which diſtinguiſhes animation from mechaniſm. Fluids may circulate in hydraulic machines, or ſimply move in them, as mercury in the barometer or thermometer, but the power of producing an embryon which ſhall gradually acquire ſimilitude to its parent, diſtinguiſhes artificial from natural organization.

The reproduction of plants and animals appears to be of two kinds, ſolitary and ſexual; the former occurs in the formation of the buds of trees, and the bulbs of tulips; which for ſeveral ſucceſſions generate other buds, and other bulbs, nearly ſimilar to the parent, but conſtantly approaching to greater perfection, ſo as finally to produce ſexual organs, or flowers, and conſequent ſeeds.

The ſame occurs in ſome inferior kinds of animals; as the aphides in the ſpring and ſummer are viviparous for eight or nine generations, which ſucceſſively produce living deſcendants without ſexual intercourſe, and are themſelves, I ſuppoſe, without ſex; at length in the autumn they propagate males and females which copulate and lay eggs, which lie dormant during the winter, and are hatched by the vernal ſun; while the truffle, and perhaps muſhrooms amongſt vegetables, and the polypus and tænia amongſt inſects, perpetually propagate themſelves by ſolitary reproduction, and have not yet acquired male and female organs.

Philoſophers have thought theſe viviparous aphides, and the tænia, and volvox to be females; and have ſuppoſed them to have been impregnated long before their nativity within each other; ſo the tænia and volvox ſtill continue to produce their offspring without ſexual intercourſe. One extremity of the tænia, is ſaid by Linnæus to grow old, whilſt at the other end new ones are generated proceeding to infinity like the roots of graſs. The volvox globator is tranſparent, and carries within itſelf children and grandchildren to the fifth generation like the aphides; ſo that the tænia produces children and grandchildren longitudinally in a chain-like ſeries, and the volvox propagates an offspring included within itſelf to the fifth generation; Syſt. Nat.

Many microſcopic animals, and ſome larger ones, as the hydra or polypus, are propagated by ſplitting or dividing; and ſome ſtill larger animals, as oyſters and perhaps eels, have not yet acquired ſexual organs, but produce a paternal progeny, which requires no mother to ſupply it with a nidus, or with nutriment and oxygenation; and, therefore, very accurately reſemble the production of the buds of trees, and the wires of ſome herbaceous plants, as of knot-graſs and of ſtrawberries, and the bulbs of other plants, as of onions and potatoes; which is further treated of in Phytologia, Sect. VII.

The manner in which I ſuſpect the ſolitary reproduction of the buds of trees to be effected, may alſo be applied to the ſolitary generation of the inſects mentioned above, and probably of many others, perhaps of all the microſcopic ones. It ſhould be previouſly obſerved, that many inſects are hermaphrodite, poſſeſſing both male and female organs of reproduction, as ſhell-ſnails and dew worms; but that theſe are ſeen reciprocally to copulate with each other, and are believed not to be able to impregnate themſelves; which belongs, therefore, to ſexual generation, and not to the ſolitary reproduction of which I am now ſpeaking.

As in the chemical production of any new combination of matter, two kinds of particles appear to be neceſſary; one of which muſt poſſeſs the power of attraction, and the other the aptitude to be attracted, as a magnet and a piece of iron; ſo in vegetable or animal combinations, whether for the purpoſe of nutrition or for reproduction, there muſt exiſt alſo two kinds of organic matter; one poſſeſſing the appetency to unite, and the other the propenſity to be united; (ſee Zoonomia, octavo edition, Sect. XXXIX. 8.) Hence in the generation of the buds of trees, there are probably two kinds of glands which acquire from the vegetable blood, and depoſite beneath the cuticle of the tree two kinds of formative organic matter, which unite and form parts of the new vegetable embryon; which again uniting with other ſuch organizations form the caudex, or the plumula, or the radicle, of a new vegetable bud.

A ſimilar mode of reproduction by the ſecretion of two kinds of organic particles from the blood, and by depoſiting them either internally as in the vernal and ſummer aphis or volvox, or externally as in the polypus and tænia, probably obtains in thoſe animals; which are thence propagated by the father only, not requiring a cradle, or nutriment, or oxygenation from a mother; and that the five generations, ſaid to be ſeen in the tranſparent volvox globator within each other, are perhaps the ſucceſſive progeny to be delivered at different periods of time from the father and erroneouſly ſuppoſed to be mothers impregnated before their nativity.

II. Sexual as well as ſolitary reproduction appears to be effected by two kinds of glands; one of which collects or ſecretes from the blood formative organic particles with appetencies to unite, and the other formative organic particles with propenſities to be united. Theſe probably undergo ſome change by a kind of digeſtion in their reſpective glands; but could not otherwiſe unite previouſly in the maſs of blood from its perpetual motion.

The firſt mode of ſexual reproduction ſeems to have been by the formation of males into hermaphrodites; that is, when the numerous formative glands, which exiſted in the caudex of the bud of a tree, or on the ſurface of a polypus, became ſo united as to form but two glands; which might then be called male and female organs. But they ſtill collect and ſecrete their adapted particles from the ſame maſs of blood as in ſnails and dew-worms, but do not ſeem to be ſo placed as to produce an embryon by the mixture of their ſecreted fluids, but to require the mutual aſſiſtance of two hermaphrodites for that purpoſe.

From this view of the ſubject, it would appear that vegetables and animals were at firſt propagated by ſolitary generation, and afterwards by hermaphrodite ſexual generation; becauſe moſt vegetables poſſeſs at this day both male and female organs in the ſame flower, which Linnæus has thence well called hermaphrodite flowers; and that this hermaphrodite mode of reproduction ſtill exiſts in many inſects, as in ſnails and worms; and, finally, becauſe all the male quadrupeds, as well as men, poſſeſs at this day ſome remains of the female apparatus, as the breaſts with nipples, which ſtill at their nativity are ſaid to be replete with a kind of milk, and the nipples ſwell on titillation.

Afterwards the ſexes ſeem to have been formed in vegetables as in flowers, in addition to the power of ſolitary reproduction by buds. So in animals the aphis is propagated both by ſolitary reproduction as in ſpring, or by ſexual generation as in autumn; then the vegetable ſexes began to exiſt in ſeparate plants, as in the claſſes monœcia and diœcia, or both of them in the ſame plant alſo, as in the claſs polygamia; but the larger and more perfect animals are now propagated by ſexual reproduction only, which ſeems to have been the chef-d'oeuvre, or capital work of nature; as appears by the wonderful tranſformations of leaf-eating caterpillars into honey-eating moths and butterflies, apparently for the ſole purpoſe of the formation of ſexual organs, as in the ſilk-worm, which takes no food after its transformation, but propagates its ſpecies and dies.

III. RECAPITULATION.

The microſcopic productions of ſpontaneous vitality, and the next moſt inferior kinds of vegetables and animals, propagate by ſolitary generation only; as the buds and bulbs raiſed immediately from ſeeds, the lycoperdon tuber, with probably many other fungi, and the polypus, volvox, and tænia. Thoſe of the next order propagate both by ſolitary and ſexual reproduction, as thoſe buds and bulbs which produce flowers as well as other buds or bulbs; and the aphis, and probably many other inſects. Whence it appears, that many of thoſe vegetables and animals, which are produced by ſolitary generation, gradually become more perfect, and at length produce a ſexual progeny.

A third order of organic nature conſiſts of hermaphrodite vegetables and animals, as in thoſe flowers which have anthers and ſtigmas in the ſame corol; and in many inſects, as leeches, ſnails, and worms; and perhaps all thoſe reptiles which have no bones, according to the obſervation of M. Poupart, who thinks, that the number of hermaphrodite animals exceeds that of thoſe which are divided into ſexes; Mém. de l'Acad. des Sciences. Theſe hermaphrodite inſects I ſuſpect to be incapable of impregnating themſelves for reaſons mentioned in Zoonomia, Sect. XXXIX. 6. 2.

And laſtly, the moſt perfect orders of animals are propagated by ſexual intercourſe only; which, however, does not extend to vegetables, as all thoſe raiſed from ſeed produce ſome generations of buds or bulbs, previous to their producing flowers, as occurs not only in trees, but alſo in the annual plants. Thus three or four joints of wheat grow upon each other, before that which produces a flower; which joints are all ſeparate plants growing over each other, like the buds of trees, previous to the uppermoſt; though this happens in a few months in annual plants, which requires as many years in the ſucceſſive buds of trees; as is further explained in Phytologia, Sect. IX. 3. 1.

IV. CONCLUSION.

Where climate is favourable, and ſalubrious food plentiful, there is reaſon to believe, that the races of animals perpetually improve by reproduction. The ſmalleſt microſcopic animals become larger ones in a ſhort time, probably by ſucceſſive reproductions, as is ſo diſtinctly ſeen in the buds of ſeedling apple-trees, and in the bulbs of tulips raiſed from ſeed; both which die annually, and leave behind them one or many, which are more perfect than themſelves, till they produce a ſexual progeny, or flowers. To which may be added, the rapid improvement of our domeſticated dogs, horſes, rabbits, pigeons, which improve in ſize or in ſwiftneſs, or in the ſagacity of the ſenſe of ſmell, or in colour, or other properties, by ſexual reproduction.

The great Linnæus having perceived the changes produced in the vegetable world by ſexual reproduction, has ſuppoſed that not more than about ſixty plants were at firſt created, and that all the others have been formed by their ſolitary or ſexual reproductions; and adds, Suadent hæc Creatoris leges a ſimplicibus ad compoſita; Gen. Plant. preface to the natural orders, and Amenit. Acad. VI. 279. This mode of reaſoning may be extended to the moſt ſimple productions of ſpontaneous vitality.

There is one curious circumſtance of animal life analogous in ſome degree to this wonderful power of reproduction; which is ſeen in the propagation of ſome contagious diſeaſes. Thus one grain of variolous matter, inſerted by inoculation, ſhall in about ſeven days ſtimulate the ſyſtem into unnatural action; which in about ſeven days more produces ten thouſand times the quantity of a ſimilar material thrown out on the ſkin in puſtules!

The myſtery of reproduction, which alone diſtinguiſhes organic life from mechanic or chemic action, is yet wrapt in darkneſs. During the decompoſition of organic bodies, where there exiſts a due degree of warmth with moiſture, new microſcopic animals of the moſt minute kind are produced; and theſe poſſeſs the wonderful power of reproduction, or of producing animals ſimilar to themſelves in their general ſtructure, but with frequent additional improvements; which the preceding parent might in ſome meaſure have acquired by his habits of life or accidental ſituation.

But it may appear too bold in the preſent ſtate of our knowledge on this ſubject, to ſuppoſe that all vegetables and animals now exiſting were originally derived from the ſmalleſt microſcopic ones, formed by ſpontaneous vitality! and that they have by innumerable reproductions, during innumerable centuries of time, gradually acquired the ſize, ſtrength, and excellence of form and faculties, which they now poſſeſs! and that ſuch amazing powers were originally impreſſed on matter and ſpirit by the great Parent of Parents! Cauſe of Cauſes! Ens Entium!

NOTE IX.—STORGE.

And heaven-born Storgè weaves the ſocial chain.
CANTO II. l. 92.

THE Greek word Storgè is uſed for the affection of parents to children; which was alſo viſibly repreſented by the Stork or Pelican feeding her young with blood taken from her own wounded boſom. A number of Pelicans form a ſemicircle in ſhallow parts of the ſea near the coaſt, ſtanding on their long legs; and thus including a ſhoal of ſmall fiſh, they gradually approach the ſhore; and ſeizing the fiſh as they advance, receive them into a pouch under their throats; and bringing them to land, regurgitate them for the uſe of their young, or for their future ſupport. Adanſon, Voyage to Senegal. In this country the parent Pigeons both male and female ſwallow the grain or other ſeeds, which they collect for their young, and bring it up mixed with a kind of milk from their ſtomachs, with their bills inſerted into the mouths of the young doves. J. Hunter's works.

The affection of the parent to the young in experienced mothers may be in part owing to their having been relieved by them from the burden of their milk; but it is difficult to underſtand, how this affection commences in thoſe mothers of the beſtial world, who have not experienced this relief from the ſucking of their offspring; and ſtill more ſo to underſtand how female birds were at firſt induced to incubate their eggs for many weeks; and laſtly how caterpillars, as of the ſilk-worm, are induced to cover themſelves with a well-woven houſe of ſilk before their transformation.

Theſe as well as many other animal facts, which are difficult to account for, have been referred to an inexplicable inſtinct; which is ſuppoſed to preclude any further inveſtigation; but as animals ſeem to have undergone great changes, as well as the inanimate parts of the earth, and are probably ſtill in a ſtate of gradual improvement; it is not unreaſonable to conclude, that ſome of theſe actions both of large animals and of inſects, may have been acquired in a ſtate preceding their preſent one; and have been derived from the parents to their offspring by imitation, or other kind of tradition; thus the eggs of the crocodile are at this day hatched by the warmth of the ſun in Egypt; and the eggs of innumerable inſects, and the ſpawn of fiſh, and of frogs, in this climate are hatched by the vernal warmth:

this might be the caſe of birds in warm climates, in their early ſtate of exiſtence; and experience might have taught them to incubate their eggs, as they became more perfect animals, or removed themſelves into colder climates: thus the oſtrich is ſaid to ſit upon its eggs only in the night in warm ſituations, and both day and night in colder ones.

This love of the mother in quadrupeds to the offspring, whom ſhe licks and cleans, is ſo allied to the pleaſure of the taſte or palate, that nature ſeems to have had a great eſcape in the parent quadruped not devouring her offspring. Bitches, and cats, and ſows, eat the placenta; and if a dead offspring occurs, I am told, that alſo is ſometimes eaten, and yet the living offspring is ſpared; and by that nice diſtinction the progenies of thoſe animals are ſaved from deſtruction!

"Certior factus ſum a viro rebus antiquiſſimis "docto, quod legitur in Beroſi operibus homines "ante diluvium mulierum puerperarum placentam "edidiſſe, quaſi cibum delicatum in epulis luxuri- "oſis; et quod hoc nefandiſſimo crimine movebatur "Deus diluvio ſubmergere terrarum incolas." ANON.

It may be finally concluded, that this affection from the parent to the progeny exiſted before animals were divided into ſexes, and produced the beginning of ſympathetic ſociety, the ſource of which may perhaps be thus well accounted for; whenever the glandular ſyſtem is ſtimulated into greater natural action within certain limits, an an addition of pleaſure is produced along with the increaſed ſecretion; this pleaſure ariſing from the activity of the ſyſtem is ſuppoſed to conſtitute the happineſs of exiſtence, in contradiſtinction to the ennui or tædium vitæ; as ſhown in Zoonomia, Sect. XXXIII. 1.

Hence the ſecretion of nutritious juices occaſioned by the ſtimulus of an embryon or egg in the womb gives pleaſure to the parent for a length of time; whence by aſſociation a ſimilar pleaſure may be occaſioned to the parent by ſeeing and touching the egg or fetus after its birth; and in lacteſcent animals an additional pleaſure is produced by the new ſecretion of milk, as well as by its emiſſion into the ſucking lips of the infant. This appears to be one of the great ſecrets of Nature, one of thoſe fine, almoſt inviſible cords, which have bound one animal to another.

The females of lactiferous animals have thus a paſſion or inlet of pleaſure in their ſyſtems more than the males, from their power of giving ſuck to their offspring; the want of the object of this paſſion, either owing to the death of the progeny, or to the unnatural faſhion of their ſituation in life, not only deprives them of this innocent and virtuous ſource of pleaſure; but has occaſioned diſeaſes, which have been fatal to many of them.

NOTE X.—EVE FROM ADAM'S RIB.

Form'd a new ſex, the mother of mankind.
CANTO II. l. 140.

The Moſaic hiſtory of Paradiſe and of Adam and Eve has been thought by ſome to be a ſacred allegory, deſigned to teach obedience to divine commands, and to account for the origin of evil, like Jotham's fable of the trees, Judges ix. 8; or Nathan's fable of the poor man and his lamb, 2 Sam. xii. 1; or like the parables in the New Teſtament; as otherwiſe knowledge could not be ſaid to grow upon one tree, and life upon another, or a ſerpent to converſe; and laſtly that this account originated with the magi or philoſophers of Egypt, with whom Moſes was educated, and that this part of the hiſtory, where Eve is ſaid to have been made from a rib of Adam might have been an hieroglyphic deſign of the Egyptian philoſophers, ſhowing their opinion that Mankind was originally of both ſexes united, and was afterwards divided into males and females: an opinion in later times held by Plato, and I believe by Ariſtotle, and which muſt have ariſen from profound inquiries into the original ſtate of animal exiſtence.

NOTE XI.—HEREDITARY DISEASES.

The feeble births acquired diſeaſes chaſe,
Till Death extinguiſh the degenerate race.
Canto II. l. 165.

As all the families both of plants and animals appear in a ſtate of perpetual improvement or degeneracy, it becomes a ſubject of importance to detect the cauſes of theſe mutations.

The inſects, which are not propagated by ſexual intercourſe, are ſo few or ſo ſmall, that no obſervations have been made on their diſeaſes; but hereditary diſeaſes are believed more to affect the offspring of ſolitary than of ſexual generation in reſpect to vegetables; as thoſe fruit-trees, which have for more than a century been propagated only by ingrafting, and not from ſeeds, have been obſerved by Mr. Knight to be at this time ſo liable to canker, as not to be worth cultivation. From the ſame cauſe I ſuſpect the degeneracy of ſome potatoes and of ſome ſtrawberries to have ariſen; where the curled leaf has appeared in the former and barren flowers in the latter.

This may ariſe from the progeny by ſolitary reproduction ſo much more exactly reſembling the parent, as is well ſeen in grafted trees compared with ſeedling ones; the fruit of the former always reſembling that of the parent tree, but not ſo of the latter. The grafted ſcion alſo accords with the branch of the tree from whence it was taken, in the time of its bearing fruit; for if a ſcion be taken from a bearing branch of a pear or apple tree, I believe, it will produce fruit even the next year, or that ſucceeding; that is, in the ſame time that it would have produced fruit, if it had continued growing on the parent tree; but if the parent pear or apple tree has been cut down or headed, and ſcions are then taken from the young ſhoots of the ſtem, and ingrafted; I believe thoſe grafted trees will continue to grow for ten or twelve years, before they bear fruit, almoſt as long as ſeedling trees, that is they will require as much time, as thoſe new ſhoots from the lopped trunk would require, before they produce fruit. It ſhould thence be inquired, when grafted fruit trees are purchaſed, whether the ſcions were taken from bearing branches, or from the young ſhoots of a lopped trunk; as the latter, I believe, are generally ſold, as they appear ſtronger plants. This greater ſimilitude of the progeny to the parent in ſolitary reproduction muſt certainly make them more liable to hereditary diſeaſes, if ſuch have been acquired by the parent from unfriendly climate, or bad nouriſhment, or accidental injury.

In reſpect to the ſexual progeny of vegetables it has long been thought, that a change of ſeed or of ſituation is in proceſs of time neceſſary to prevent their degeneracy; but it is now believed, that it is only changing for ſeed of a ſuperior quality, that will better the product. At the ſame time it may be probably uſeful occaſionally to intermix ſeeds from different ſituations together; as the anther-duſt is liable to paſs from one plant to another in its vicinity; and by theſe means the new ſeeds or plants may be amended, like the marriages of animals into different families.

As the ſexual progeny of vegetables are thus leſs liable to hereditary diſeaſes than the ſolitary progenies; ſo it is reaſonable to conclude, that the ſexual progenies of animals may be leſs liable to hereditary diſeaſes, if the marriages are into different families, than if into the ſame family; this has long been ſuppoſed to be true, by thoſe who breed animals for ſale; ſince if the male and female be of different temperaments, as theſe are extremes of the animal ſyſtem, they may counteract each other; and certainly where both parents are of families, which are afflicted with the ſame hereditary diſeaſe, it is more likely to deſcend to their poſterity.

The hereditary diſeaſes of this country have many of them been the conſequence of drinking much fermented or ſpirituous liquor; as the gout always, moſt kinds of dropſy, and, I believe, epilepſy, and inſanity. But another material, which is liable to produce diſeaſes in its immoderate uſe, I believe to be common ſalt; the ſea-ſcurvy is evidently cauſed by it in long voyages; and I ſuſpect the ſcroſula, and conſumption, to ariſe in the young progeny from the debility of the lymphatic and venous abſorption produced in the parent by this innutritious foſſile ſtimulus. The petechiæ and vibices in the ſea-ſcurvy and occaſional hæmorrhages evince the defect of venous abſorption; the occaſional hæmoptoe at the commencement of pulmonary conſumption, ſeems alſo to ariſe from defect of venous abſorption; and the ſcrofula, which ariſes from the inactivity of the lymphatic abſorbent ſyſtem, frequently exiſts along with pulmonary as well as with meſenteric conſumption. A tendency to theſe diſeaſes is certainly hereditary, though perhaps not the diſeaſes themſelves; thus a leſs quantity of ale, cyder, wine, or ſpirit, will induce the gout and dropſy in thoſe conſtitutions, whoſe parents have been intemperate in the uſe of thoſe liquors; as I have more than once had occaſion to obſerve.

Finally the art to improve the ſexual progeny of either vegetables or animals muſt conſiſt in chooſing the moſt perfect of both ſexes, that is the moſt beautiful in reſpect to the body, and the moſt ingenious in reſpect to the mind; but where one ſex is given, whether male or female, to improve a progeny from that perſon may conſiſt in chooſing a partner of a contrary temperament.

As many families become gradually extinct by hereditary diſeaſes, as by ſcrofula, conſumption, epilepſy, mania, it is often hazardous to marry an heireſs, as ſhe is not unfrequently the laſt of a diſeaſed family.

NOTE XII.—CHEMICAL THEORY OF ELECTRICITY AND MAGNETISM.

Then mark how two electric ſtreams conſpire
To form the reſinous and vitreous fire.

CANTO III. l. 21.

I. OF ATTRACTION AND REPULSION.

THE motions, which accompliſh the combinations and decompoſitions of bodies, depend on the peculiar attractions and repulſions of the particles of thoſe bodies, or of the ſides and angles of them; while the motions of the ſun and planets, of the air and ocean, and of all bodies approaching to a general centre or retreating from it, depend on the general attraction or repulſion of thoſe maſſes of matter. The peculiar attractions above mentioned are termed chemical affinities, and the general attraction is termed gravitation; but the peculiar repulſions of the particles of bodies, or the general repulſion of the maſſes of matter, have obtained no ſpecific names, nor have been ſufficiently conſidered, though they appear to be as powerful agents as the attractions.

The motions of ethereal fluids, as of magnetiſm and electricity, are yet imperfectly underſtood, and ſeem to depend both on chemical affinity, and on gravitation; and alſo on the peculiar repulſions of the particles of bodies, and on the general repulſion of the maſſes of matter.

In what manner attraction and repulſion are produced has not yet been attempted to be explained by modern philoſophers; but as nothing can act, where it does not exiſt, all diſtant attraction of the particles of bodies, as well as general gravitation, muſt be aſcribed to ſome ſtill finer ethereal fluid; which fills up all ſpace between the ſuns and their planets, as well as the interſtices of coherent matter. Repulſion in the ſame manner muſt conſiſt of ſome finer ethereal fluid; which at firſt projected the planets from the ſun, and I ſuppoſe prevents their return to it; and which occaſionally volatilizes or decompoſes ſolid bodies into fluid or ærial ones, and perhaps into ethereal ones.

May not the ethereal matter which conſtitutes repulſion, be the ſame as the matter of heat in its diffuſed ſtate; which in its quieſcent ſtate is combined with various bodies, as appears from many chemical exploſions, in which ſo much heat is ſet at liberty? The ethereal matter, which conſtitutes attraction, we are leſs acquainted with; but it may alſo exiſt combined with bodies, as well as in its diffuſed ſtate; ſince the ſpecific gravities of ſome metallic mixtures are ſaid not to accord with what ought to reſult from the combination of their ſpecific gravities, which exiſted before their mixture; but their abſolute gravities have not been attended to ſufficiently; as theſe have always been ſuppoſed to depend on their quantity of matter, and ſituation in reſpect to the centre of the earth.

The ethereal fluids, which conſtitute peculiar repulſions and attractions, appear to gravitate round the particles of bodies mixed together; as thoſe which conſtitute the general repulſion or attraction, appear to gravitate round the greater maſſes of matter mixed together; but that which conſtitutes attraction ſeems to exiſt in a denſer ſtate next to the particles or maſſes of matter; and that which conſtitutes repulſion to exiſt more powerfully in a ſphere further from them; whence many bodies attract at one diſtance, and repel at another. This may be obſerved by approaching to each other two electric atmoſpheres round inſulated cork-balls; or by preſſing globules of mercury, which roll on the ſurface till they unite with it: or by preſſing the drops of water, which ſtand on a cabbage leaf, till they unite with it, and hence light is reflected from the ſurface of a mirror without touching it.

Thus the peculiar attractions and repulſions of the particles of bodies, and the general ones of the maſſes of matter, perpetually oppoſe and counteract each other; whence if the power of attraction ſhould ceaſe to act, all matter would be diſſipated by the power of repulſion into boundleſs ſpace; and if heat, or the power of repulſion, ſhould ceaſe to act, the whole world would become one ſolid maſs, condenſed into a point.

II. PRELIMINARY PROPOSITIONS.

The following propoſitions concerning Electricity and Galvaniſm will either be proved by direct experiments, or will be rendered probable by their tending to explain or connect the variety of electric facts, to which they will be applied.

1. There are two kinds of electric ether, which exiſt either ſeparately or in combination. That which is accumulated on the ſurface of ſmooth glaſs, when it is rubbed with a cuſhion, is here termed vitreous ether; and that which is accumulated on the ſurface of reſin or ſealing-wax, when it is rubbed with a cuſhion, is here termed reſinous ether; and a combination of them as in their uſual ſtate, may be termed neutral electric ethers.

2. Atmoſpheres of vitreous or of reſinous or of neutral electricity ſurround all ſeparate bodies, are attracted by them, and permeate thoſe which are called conductors, as metallic and aqueous and carbonic ones; but will not permeate thoſe, which are termed nonconductors, as air, glaſs, ſilk, reſin, ſulphur.

3. The particles of vitreous electric ether ſtrongly repel each other as they ſurround other bodies; but ſtrongly attract the particles of reſinous electric ether: in ſimilar manner the particles of the reſinous ether powerfully repel each other, and as powerfully attract thoſe of the vitreous ether. Hence in their ſeparate ſtate they appear to occupy much greater ſpace, as they gravitate round inſulated bodies, and are then only cognizable by our ſenſes or experiments. They ruſh violently together through

conducting ſubſtances, and then probably poſſeſs much leſs ſpace in this their combined ſtate. They thus reſemble oxygen gas and nitrous gas; which ruſh violently together when in contact; and occupy leſs ſpace when united, than either of them poſſeſſed ſeparately before their union. When the two electric ethers thus unite, a chemical exploſion occurs, like an ignited train of gunpowder; as they give out light and heat; and rend or fuſe the bodies they occupy; which cannot be accounted for on the mechanical theory of Dr. Franklin.

4. Glaſs holds within it in combination much reſinous electric ether, which conſtitutes a part of it, and which more forcibly attracts vitreous electric ether from ſurrounding bodies, which ſtands on it mixed with a leſs proportion of reſinous ether like an atmoſphere, but cannot unite with the reſinons ether, which is combined with the glaſs; and reſin, on the contrary, holds within it in combination much vitreous electric ether, which conſtitutes a part of it, and which more forcibly attracts reſinous electric ether from ſurrounding bodies, which ſtands on it mixed with a leſs proportion of vitreous ether like an atmoſphere, but cannot unite with the vitreous ether, which is combined with the reſin.

As in the production of vitrification, thoſe materials are neceſſary which contain much oxygen, as minium, and mangane e; there is probably much oxygen combined with glaſs, which may thence be eſteemed a ſolid acid, as water may be eſteemed a fluid one. It is hence not improbable, that one kind of electric ether may alſo be combined with it, as it ſeems to affect the oxygen of water in the Galvanic experiments. The combination of the other kind of electric ether with wax or ſulphur, is countenanced from thoſe bodies, when heated or melted, being ſaid to part with much electricity as they cool, and as it appears to affect the hydrogen in the decompoſition of water by Galvaniſm.

5 .Hence the nonconductors of electricity are of two kinds; ſuch as are combined with vitreous ether, as reſin, and ſulphur; and ſuch as are combined with reſinous ether, as glaſs, air, ſilk. But both theſe kinds of nonconductors are impervious to either of the electric ethers; as thoſe ethers being already combined with other bodies, will not unite with each other, or be removed from their ſituations by each other. Whereas the perfect conducting bodies, as metals, water, charcoal, though ſurrounded with electric atmoſpheres, as they have neither of the electric ethers combined with them, ſuffer them to permeate and paſs through them, whether ſeparately or in their neutral ſtate of reciprocal combination.

But it is probable, that imperfect conductors may poſſeſs more or leſs of either the vitreous or reſinous ether combined with them, ſince their natural atmoſpheres are diſſimilar as mentioned below; and that this makes them more or leſs imperfect conductors.

6. Thoſe bodies which are perfect conductors, have probably neutral electric atmoſpheres gravitating round them conſiſting of an equal or ſaturated mixture of the two electric ethers, whereas the atmoſpheres round the nonconducting bodies probably conſiſt of an unequal mixture of the electric ethers, as more of the vitreous one round glaſs, and more of the reſinous one round reſin; and, it is probable, that theſe mixed atmoſpheres, which ſurround imperfect conducting bodies, conſiſt alſo of different proportions of the vitreous and reſinous ethers according to their being more or leſs perfect conductors. Theſe minute degrees of the difference of theſe electric atmoſpheres are evinced by Mr. Bennet's Doubler of Electricity, as ſhown in his work, and are termed by him Adheſive Electric Atmoſpheres, to diſtinguiſh them from thoſe accumulated by art; thus the natural adheſive electricity of ſilver is more of the vitreous kind compared with that of zinc, which conſiſts of a greater proportion of the reſinous; that is, in his language, ſilver is poſitive and zinc negative. This experiment I have ſucceſsfully repeated with Mr. Bennet's Doubler along with Mr. Swanwick.

7. Great accumulation or condenſation of the ſeparate electric ethers attract each other ſo ſtrongly, that they will break a paſſage through nonconducting bodies, as through a plate of glaſs, or of air, and will rend bodies which are leſs perfect conductors, and give out light and heat like the ex-

ploſion of a train of gunpowder; whence, when a ſtrong electric ſhock is paſſed through a quire of paper, a bur, or elevation of the ſheets, is ſeen on both ſides of it occaſioned by the exploſion. Whence trees and ſtone walls are burſt by lightning, and wires are fuſed, and inflammable bodies burnt, by the heat given out along with the flaſh of light, which cannot be explained by the mechanic theory.

8. When artificial or natural accumulations of theſe ſeparate ethers are very minute in quantity or intenſity, they paſs ſlowly and with difficulty from one body to another, and require the beſt conductors for this purpoſe; whence many of the phænomena of the torpedo or gymnotus, and of Galvaniſm. Thus after having diſcharged a coated jar, if the communicating wire has been quickly withdrawn, a ſecond ſmall ſhock may be taken after the principal diſcharge, and this repeatedly two or three times.

Hence the charge of the Galvanic pile being very minute in quantity or intenſity, will not readily paſs through the dry cuticle of the hands, though it ſo eaſily paſſes through animal fleſh or nerves, as this combination of charcoal with water ſeems to conſtitute the moſt perfect conductor yet known.

9. As light is reflected from the ſurface of a mirror before it actually touches it, and as drops of water are repelled from cabbage-leaves without touching them, and as oil lies on water without touching it, and alſo as a fine needle may be made

to lie on water without touching it, as ſhown by Mr. Melville in the Literary Eſſays of Edinburgh; there is reaſon to believe, that the vitreous and reſinous electric ethers are repelled by, or will not paſs through, the ſurfaces of glaſs or reſin, to which they are applied. But though neither of theſe electric ethers paſſes through the ſurfaces of glaſs or reſin, yet their attractive or repulſive powers paſs through them; as the attractive or repulſive power of the magnet to iron paſſes through the atmoſphere, and all other bodies which exiſt between them. So an inſulated cork-ball when electriſed either with vitreous or reſinous ether, repels another inſulated cork-ball electriſed with the ſame kind of ether, through half an inch of common air, though theſe electric atmoſpheres do not unite.

Whence it may be concluded, that the general attractive and repulſive ethers accompany the electric ethers as well as they accompany all other bodies; and that the electric ethers do not themſelves attract or repel through glaſs or reſin, as they cannot paſs through them, but ſtrongly attract each other when they come into contact, ruſh together, and produce an exploſion of the ſudden liberation of heat and light.

III. EFFECT OF METALLIC POINTS.

1. When a pointed wire is preſented by a perſon ſtanding on the ground to an inſulated conductor,

on which either vitreous or reſinous electricity is accumulated, the accumulated electricity will paſs off at a much greater diſtance than if a metallic knob be fixed on the wire and preſented in its ſtead.

2. The ſame occurs if the metallic point be fixed on the electriſed conductor, and the finger of a perſon ſtanding on the ground be preſented to it, the accumulated electricity will paſs off at a much greater diſtance, and indeed will ſoon diſcharge itſelf by communicating the accumulated electricity to the atmoſphere.

3. If the metallic point be fixed on the prime conductor, and the flame of a candle be preſented to it, on electriſing the conductor either with vitreous or reſinous ether, the flame of the candle is blown from the point, which muſt be owing to the electric fluid in its paſſage from the point carrying along with it a ſtream of atmoſpheric air.

The manner in which the accumulated electricity ſo readily paſſes off by a metallic point may be thus underſtood; when a metallic point ſtands erect from an electriſed metallic plane, the accumulated electricity which exiſts on the extremity of the point, is attracted leſs than that of the other parts of the electriſed ſurface. For the particle of electric matter immediately over the point is attracted by that point only, whereas the particles of electric matter over every other part of the electriſed plane, is not only attracted by the parts of the plane immediately under them, but alſo laterally by the circumjacent parts of it; whence the accumulated electric fluid is puſhed off at this point by that over the other parts being more ſtrongly attracted to the plane.

Thus if a light inſulated horizontal fly be conſtructed of wire with points fixed as tangents to the circle, it will revolve the way contrary to the direction of the points as long as it continues to be electriſed. For the ſame reaſon as when a circle of cork, with a point of the cork ſtanding from it like a tangent, is ſmeared with oil, and thrown upon a lake, it will continue to revolve backwards in reſpect to the direction of the point till all the oil is diſperſed upon the lake, as firſt obſerved by Dr. Franklin; for the oil being attracted to all the other parts of the cork-circle more than towards the pointed tangent, that part over the point is puſhed off and diffuſes itſelf on the water, over which it paſſes without touching, and conſequently without friction; and thus the cork revolves in the contrary direction.

As the flame of a candle is blown from a point fixed on an electriſed conductor, whether vitreous or reſinous electricity is accumulated on it, it ſhows that in both caſes electricity paſſes from the point, which is a forcible argument againſt the mechanical theory of poſitive and negative electricity; becauſe then the flame ſhould be blown towards the point in one caſe, and from it in the other.

So the electric fly, as it turns horizontally, recedes from the direction of the points of the tangents, whether it be electriſed with vitreous or reſinous electricity; whereas if it was ſuppoſed to receive electricity, when electriſed by reſin, and to part with it when electriſed by glaſs, it ought to revolve different ways; which alſo forcibly oppoſes the theory of poſitive and negative electricity.

As an electriſed point with either kind of electricity cauſes a ſtream of air to paſs from it in the direction of the point, it ſeems to affect the air much in the ſame manner as the fluid matter of heat affects it; that is, it will not readily paſs through it, but will adhere to the particles of air, and is thus carried away with them.

From this it will alſo appear, that points do not attract electricity, properly ſpeaking, but ſuffer it to depart from them; as it is there leſs attracted to the body which it ſurrounds, than by any other part of the ſurface.

And as a point preſented to an electriſed conductor facilitates the diſcharge of it, and blows the flame of a candle towards the conductor, whether vitreous or reſinous electricity be accumulated upon it; it follows, that in both caſes ſome electric matter paſſes from the point to the conductor, and that hence there are two electric ethers; and that they combine or explode when they meet together, and give out light and heat, and occupy leſs ſpace in this their combined ſtate, like the union of nitrous gas with oxygen gas.

IV. ACCUMULATION OF ELECTRIC ETHERS BY CONTACT.

The electric ethers may be ſeparately accumulated by contact of conductors with nonconductors, by vicinity of the two ethers, by heat, and by decompoſition.

Glaſs is believed to conſiſt in part of conſolidated reſinous ether, and thence to attract an electric atmoſphere round it, which conſiſts of a greater proportion of vitreous ether compared to the quantity of the reſinous, as mentioned in Propoſition No. 4. This atmoſphere may ſtand off a line from the ſurface of the glaſs, though its attractive or repulſive power may extend to a much greater diſtance; and a more equally mixed electric atmoſphere may ſtand off about the ſame diſtance from the ſurface of a cuſhion.

Now when a cuſhion is forcibly preſſed upon the ſurface of a glaſs cylinder or plane, the atmoſphere of the cuſhion is forced within that of the glaſs, and conſequently the vitreous part of it is brought within the ſphere of the attraction of the reſinous ether combined with the glaſs, and therefore becomes attracted by it in addition to the vitreous part of the ſpontaneous atmoſphere of the glaſs; and the reſinous part of the atmoſphere of the cuſhion is at the ſame time repelled by its vicinity to the combined reſinous ether of the glaſs. From both which circumſtances a vitreous ether alone ſurrounds the part of the glaſs on which the cuſhion is forcibly preſſed; which does not, nevertheleſs, reſemble an electriſed coated jar; as this accumulation of vitreous ether on one ſide of the glaſs is not ſo violently condenſed, or ſo forcibly attracted to the glaſs by the looſe reſinous ether on the other ſide of it, as occurs in the charged coated jar.

Hence as weak differences of the kinds or quantities of electricity do not very rapidly change place if the cuſhion be ſuddenly withdrawn, with or without friction, I ſuppoſe an accumulation of vitreous electric ether will be left on the ſurface of the glaſs, which will diffuſe itſelf on an inſulated conductor by the aſſiſtance of points, or will gradually be diſſipated in the air, probably like odours by the repulſion of its own particles, or may be conducted away by the ſurrounding air as it is repelled from it, or by the moiſture or other impurities of the atmoſphere. And hence I do not ſuppoſe the friction of the glaſs-globe to be neceſſary, except for the purpoſe of more eaſily removing the parts of the ſurface from the preſſure of the cuſhion to the points of the prime conductor, and to bring them more eaſily into reciprocal contact.

When ſealing wax or ſulphur is rubbed by a cuſhion, exactly the ſame circumſtance occurs, but with the different ethers; as the reſinous ether of the ſpontaneous atmoſphere of the cuſhion, when it is preſſed within the ſpontaneous atmoſphere of the ſealing wax, is attracted by the ſolid vitreous ether which is combined with it; and at the ſame time the vitreous ether of the cuſhion is repelled by it; and hence an atmoſphere of reſinous ether alone exiſts between the ſealing wax and the cuſhion thus preſſed together. It is nevertheleſs poſſible, that friction on both ſealing wax and glaſs may add ſome facility to the accumulations of their oppoſite ethers by the warmth which it occaſions. As moſt electric machines ſucceed beſt after being warmed, I think even in dry froſty ſeaſons.

Though when a cuſhion is applied to a ſmooth ſurfaced glaſs, ſo as to intermix their electric atmoſpheres, the vitreous ether of the cuſhion is attracted by the reſinous ether combined with the glaſs; but does not intermix with it, but only adheres to it: and as the glaſs turns round the vitreous electric atmoſphere ſtands on the ſolid reſinous electric ether combined with the glaſs; and is taken away by the metallic points of the prime conductor.

Yet if the ſurface of the glaſs be roughened by ſcratching it with a diamond or with hard ſand, a new event occurs; which is, that the vitreous ether attracted from the cuſhion by the reſinous ether combined with the glaſs becomes adheſive to it; and ſtands upon the roughened glaſs, and will not quit the glaſs to go to the prime conductor; whence the ſurface of the glaſs having a vitreous electric atmoſphere united, as it were, to its inequalities, becomes ſimilar to reſin; and will now attract reſinous electric ether, like a ſtick of ſealing wax, without combining with it. Whence this curious and otherwiſe unintelligible phenomenon, that ſmooth ſurfaced glaſs will give vitreous electric ether to an inſulated conductor, and glaſs with a roughened ſurface will give reſinous ether to it.

V. ACCUMULATION OF ELECTRIC ETHERS BY VICINITY.

Though the contact of a cuſhion on the whirling glaſs is the eaſieſt method yet in uſe for the accumulation of the vitreous electric ether on an inſulated conductor; yet there are other methods of effecting this, as by the vicinity of the two electric ethers with a nonconductor between them.

Thus I believe a great quantity of both vitreous and reſinous electric ether may be accumulated in the following manner. Let a glaſs jar be coated within in the uſual manner; but let it have a looſe external coating, which can eaſily be withdrawn by an inſulating handle. Then charge the jar, as highly as it may be, by throwing into it vitreous electric ether; and in this ſtate hermetically ſeal it, if practicable, otherwiſe cloſe it with a glaſs ſtopple and wax. When the external coating is drawn off by an inſulating handle, having previouſly had a communication with the earth, it will poſſeſs an accumulation of reſinous electric ether; and then touching it with your finger, a ſpark will be ſeen, and there will ceaſe to be any accumulated ether.

Thus by alternately replacing this looſe coating, and withdrawing it from the ſealed charged jar, by means of an inſulating handle; and by applying it to one inſulated conductor, when it is in the vicinity of the jar; and to another inſulated conductor, when it is withdrawn; vitreous electric ether may be accumulated on one of them, and reſinous on the other; and thus I ſuſpect an immenſe quantity of both ethers may be produced without friction or much labour, if a large electric battery was ſo contrived; and that it might be applied to many mechanical purpoſes, where other exploſions are now uſed, as in the place of ſteam engines, or to rend rocks, or timber, or deſtroy invading armies!

The principle of this mode of accumulating the two electric ethers in ſome meaſure reſembles that of Volta's Electrophorus and Bennet's Doubler.

VI. ACCUMULATION OF ELECTRIC ETHERS BY HEAT AND BY DECOMPOSITION.

When glaſs or amber is heated by the fire in a dry ſeaſon, I ſuſpect that it becomes in ſome degree electric; as either of the electric ethers which is combined with them may have its combination with thoſe materials looſened by the application of heat; and that on this account they may more forcibly attract the oppoſite one from the air in their vicinity.

It has long been known, that a ſiliceous ſtone called the tourmalin, when its ſurfaces are poliſhed, if it be laid down before the fire, will become electrified with vitreous, or what is called poſitive electricity on its upper ſurface: and reſinous, or what is called negative electricity on its under ſurface; which I ſuppoſe lay in contact with ſomewhat which ſupported it near the fire.

In this experiment I ſuppoſe the tourmalin to be naturally combined with reſinous electric ether like glaſs; which on one ſide next towards the fire by the increaſe of its attractive power, owing to the heat having looſened its combination with the earth of the ſtone, more ſtrongly attracts vitreous electric ether from the atmoſphere; which now ſtands on its ſurface: and then as the lower ſurface of the ſtone lies in contact with the hearth, the leſs quantity of vitreous ether is there repelled by the greater quantity of it on the upper ſurface; while the reſinous ether is attracted by it: and the ſtone is thus charged like a coated jar with vitreous electric ether condenſed on one ſide of it, and reſinous on the other.

So cats, as they lie by the fire in a froſty day, become ſo electric as frequently to give a perceptible ſpark to one's finger from their ears without friction.

A fourth method of ſeparating the two ethers would ſeem to be by the decompoſition of metallic bodies, as in the experiment with Volta's Galvanic pile; which is ſaid by Mr. Davy to act ſo much more powerfully, when an acid is added to the water uſed in the experiment; as will be ſpoken of below.

From experiments made by M. Sauſſure on the electricity of evaporated water from hot metallic veſſels, and from thoſe of china and glaſs, he found when the veſſel was calcined or made ruſty by the evaporating water, that the electricity of it was poſitive (or vitreous), and that from china or glaſs was negative (or reſinous), Encyclop. Britan. Art. Elect. No. 206, which ſeems alſo to ſhow, that vitreous electric ether was given out or produced by the corroſion of metals, and reſinous ether from the evaporation of water.

VII. THE SPARK FROM THE CONDUCTOR, AND OF ELECTRIC LIGHT.

When either the vitreous or reſinous electric ether is accumulated on an inſulated conductor, and an uninſulated conductor, as the finger of an attendant, is applied nearly in contact with it, what happens? The attractive and repulſive powers of the accumulated electric ether paſs through the nonconducting plate of air, and if it be of the vitreous kind, it attracts the reſinous electric ether of the finger towards it, and repels the vitreous electric ether of the finger from it.

Hence there exiſts for an inſtant a charged plate of air between the finger and the prime conductor, with an accumulation of vitreous ether on one ſide of it, and of reſinous ether on the other ſide of it; and laſtly theſe two kinds of electric ethers ſuddenly unite by their powerful attraction of each other, explode, and give out heat and light, and rupture the plate of nonconducting air, which ſeparated them.

The rupture or disjunction of the plate of air is known by the ſound of the ſpark, as of thunder; which ſhows that a vacuum of air was previouſly produced by the exploſion of the electric fluids, and a vibration of the air in conſequence of the ſudden joining again of the ſides of the vacuum.

The light which attends electric ſparks and ſhocks, is not accounted for by the Theory of Dr. Franklin. I ſuſpect that it is owing to the combination of the two electric ethers, from which as from all chemical exploſions both light and heat are ſet at liberty, and becauſe a ſmell is ſaid to be perceptible from electric ſparks, and even a taſte, which muſt be deduced from new combinations, or decompoſitions, as in other exploſions: add to this that the ſame thing occurs, when electric ſhocks are paſſed through eggs in the dark, or through water, a luminous line is ſeen like the exploſion of a train of gunpowder; laſtly, whether light is really produced in the paſſage of the Galvanic electricity through the eyes, or that the ſenſation alone of light is perceived by its ſtimulating the optic nerve, has not yet been inveſtigated; but I ſuſpect the former, as it emits light from its exploſion even in paſſing through eggs and through water, as mentioned above.

VIII. THE SHOCK FROM THE COATED JAR, AND OF ELECTRIC CONDENSATION.

1. When a glaſs jar is coated on both ſides, and either vitreous or reſinous electricity is thrown upon the coating on one ſide, and there is a communication to the earth from the other ſide, the ſame thing happens as in the plate of air between the finger and prime conductor above deſcribed; that is, the accumulated electricity, if it be of the vitreous kind on one coating of the glaſs jar will attract the reſinous part of the electricity, which ſurrounds or penetrates the coating on the other ſide of the jar, and alſo repel the vitreous part of it; but this occurs on a much more extenſive ſurface than in the inſtance of the plate of air between the finger and prime conductor.

The difference between electric ſparks and ſhocks conſiſts in this circumſtance, that in the former the inſulating medium, whether of air, or of thin glaſs, is ruptured in one part, and thus a communication is made between the vitreous and reſinous ethers, and they unite immediately, like globules of quickſilver, when preſſed forcibly together: but in the electric ſhock a communication is made by ſome conducting body applied to the other extremities of the vitreous, and of the reſinous atmoſpheres, through which they paſs and unite, whether both ſides of the coated jar are inſulated, or only one ſide of it.

And in this line, as they reciprocally meet, they appear to explode and give out light and heat, and a new combination of the two ethers is produced, as a reſiduum after the exploſion, which probably occupies much leſs ſpace than either the vitreous or reſinous ethers did ſeparately before. At the ſame time there may be another unreſtrainable ethereal fluid yet unobſerved, given out from this exploſion, which rends oak trees, burſt ſtone-walls, lights inflammable ſubſtances, and fuſes metals, or diſſipates them in a calciform ſmoke, along with which great light and much heat are emitted, or theſe effects are produced by the heat and light only thus ſet at liberty by their ſynchronous and ſudden evolution.

2. The curious circumſtance of electric condenſation appears from the violence of the ſhock of the coated jar compared with the ſtrongeſt ſpark from an inſulated conductor, though the latter poſſeſſes a much greater ſurface; when vitreous electric ether is thrown on one ſide of a coated jar, it attracts the reſinous electric ether of the other ſide of the coated jar; and the ſame occurs, when reſinous ether is thrown on one ſide of it, it attracts the vitreous ether of the other ſide of it, and thus the vitreous

electric ether on one ſide of the jar, and the reſinous ether on the other ſide of it become condenſed, that is accumulated in leſs ſpace, by their reciprocal attraction of each other.

This condenſation of the two electric ethers owing to their reciprocal attraction appears from another curious event, that the thinner the glaſs jar is, the ſtronger will the charge be on the ſame quantity of ſurface, as then the two ethers approaching nearer without their intermixing attract each other ſtronger, and conſequently condenſe each other more. And when the glaſs jar is very thin the reciprocal attractive powers of the vitreous and reſinous ether attract each other ſo violently as at length to paſs through the glaſs by rupturing it, in the ſame manner as a leſs forcible attraction of them ruptures and paſſes through the plate of air in the production of ſparks from the prime conductor.

As theſe two ethers on each ſide of a charged coated jar ſo powerfully attract each other, when a communication is made between them by ſome conducting ſubſtance as in the common mode of diſcharging an electriſed coated jar, they reciprocally paſs to each other for the purpoſe of combining, as ſome chemical fluids are known to do; as when nitrous gas and oxygen gas are mixed together; whence as theſe fluids paſs both ways to intermix with each other, and then explode; a bur appears on each ſide of a quire of paper well preſſed together, when a ſtrong electric ſhock is paſſed through it; which is occaſioned by their exploſion, like a train of gunpowder, and conſequent emiſſion of ſome other ethereal fluid, either thoſe of heat and light or of some new one not yet obſerved. Whence it becomes difficult to explain, according to the theory of Dr. Franklin, which way the electric fluid paſſed, and which ſide of the coated jar contained poſitive and which the negative charge according to that doctrine.

But the theory of the ingenious Dr. Franklin failed alſo in explaining other phenomena of the coated jar; ſince if the poſitive electricity accumulated on one ſide of the jar repelled the electricity from the coating on the other ſide of it, ſo as to produce an electric vacuum; why ſhould it be ſo eager, when a communication is made by ſome conducting body, to run into that vacuum by its attraction or gravitation, which has been made by its repulſion; as thus it ſeems to be violently attracted by the vacuum, from which it had previouſly repelled a fluid ſimilar to itſelf, which is not eaſily to be comprehended.

3. There is another mode by which either vitreous or reſinous electric ether is capable of condenſation; which conſiſts in contracting the volume, ſo as to diminiſh the ſurface of the electrifed body; as was ingeniouſly ſhown by Dr. Franklin's experiment of electriſing a ſilver tankard with a length of chain rolled up within it; and then drawing up the chain by a ſilk ſtring, which

weakened the electric attraction of the tankard; which was strengthened again by returning the chain into it; thus the condenſation of an electriſed cloud is believed to condenſe the electric ether, which it contains, and thus to occaſion the lightning paſſing from one cloud to another, or from a cloud into the earth.

This experiment of the chain and tankard is ſaid to ſucceed as well with what is termed negative electricity in the theory of Dr. Franklin, as with what is termed poſitive electricity; but in that theory the negative electricity means a leſs quantity or total deprivation or vacuity of that fluid; now to condenſe negative electricity by lowering the ſuſpended chain into the tankard ought to make it leſs negative; whereas in this experiment I am told it becomes more ſo, as appears by its ſtronger repulſion of cork balls ſuſpended on ſilk ſtrings, and previouſly electriſed by rubbed ſealing wax: and if the negative electricity be believed to be a perfect vacuum of it, the condenſation of a vacuum of electricity is totally incomprehenſible; and this experiment alone ſeems to demonſtrate the exiſtence of two electric ethers.

IX. OF GALVANIC ELECTRICITY.

1. The conductors of electricity, as well as the nonconductors of it, have probably a portion of the

vitreous and reſinous ethers combined with them, and have alſo another portion of theſe ethers diffuſed round them, which forms their natural or ſpontaneous adheſive atmoſpheres; and which exiſts in different proportions round them correſpondent in quantity to thoſe which are combined with them, but oppoſite in kind.

Theſe adheſive ſpontaneous atmoſpheres of electricity are shown to conſiſt of different proportions or quantities of the electric ethers by Mr. Bennet's Doubler of Electricity, as mentioned in his work called New Experiments on Electricity, ſold by Johnſon. In this work, p. 91, the blade of a ſteel knife was evidently, in his language, poſitive, compared to a ſoft iron wire which was comparatively negative; ſo the adheſive electricity of gold, ſilver, copper, braſs, biſmuth, mercury, and various kinds of wood and ſtone, were what he terms poſitive or vitreous; and that of tin and zinc, what he terms negative or reſinous.

Where these ſpontaneous atmoſpheres of diffuſed electricity ſurrounding two conducting bodies, as two pieces of ſilver, are perfectly ſimilar, they probably do not intermix when brought into the vicinity of each other; but if theſe ſpontaneous atmoſpheres of diffuſed electricity are different in reſpect to the proportion of the two ethers, or perhaps in reſpect to their quantity, in however ſmall degree either of theſe circumſtances exiſts, they may be made to unite but with ſome difficulty;

as the two metallic plates, ſuppoſe one of ſilver, and another of zinc, which they ſurround, muſt be brought into abſolute or adheſive contact; or otherwiſe theſe atmoſpheres may be forced together ſo as to be much flattened, and compreſs each other where they meet, like ſmall globules of quickſilver when preſſed together, but without uniting.

This curious phenomenon may be ſeen in more denſe electric atmoſpheres accumulated by art, as in the following experiment aſcribed to Mr. Canton. Lay a wooden ſkewer the ſize of a gooſe-quill acroſs a dry wine-glaſs, and another acroſs another wine-glaſs; let the ends of them touch each other, as they lie in a horizontal line; call them X and Y; approach a rubbed glaſs-tube near the external end of the ſkewer X, but not ſo as to touch it; then ſeparate the two ſkewers by removing the wine-glaſſes further from each other; and laſtly, withdraw the rubbed glaſs-tube, and the ſkewer X will now be found to poſſeſs reſinous electricity, which has been generally called negative or minus electricity; and the ſkewer Y will be found to poſſeſs vitreous, or what is generally termed poſitive or plus electricity.

The ſame phenomenon will occur if rubbed ſealing wax be applied near to, but not in contact with, the ſkewer X, as the ſkewer X will then be left with an atmoſphere of vitreous ether, and the ſkewer Y with one of reſinous ether. Theſe experiments alſo evince the exiſtence of two electric fluids, as they cannot be underſtood from an idea of one being a greater or leſs quantity of the ſame material; as a vacuum of electric ether, brought near to one end of the ſkewer, cannot be conceived ſo to attract the ether as to produce a vacuum at the other end.

In this experiment the electric atmoſpheres, which are nearly of ſimilar kinds, do not ſeem to touch, as there may remain a thin plate of air between them, in the ſame manner as ſmall globules of mercury may be preſſed together ſo as to compreſs each other, long before they intermix; or as plates of lead or braſs require ſtrongly to be preſſed together before they acquire the attraction of coheſion; that is, before they come into real contact.

2. It is probable, that all bodies are more or leſs perfect conductors, as they have leſs or more of either of the electric ethers combined with them; as mentioned in Preliminary Propoſition, No. VI. as they may then leſs reſiſt the paſſage of either of the ethers through them. Whence ſome conducting bodies admit the junction of theſe ſpontaneous electric atmoſpheres, in which the proportions or quantities of the two ethers are not very different, with greater facility than others.

Thus in the common experiments where the vitreous or reſinous ether is accumulated by art, metallic bodies have been eſteemed the beſt conductors, and next to theſe water, and all other moiſt bodies; but it was lately diſcovered, that dry charcoal, recently burnt, was a more perfect conductor than metals; and it appears from the experiments diſcovered by Galvani, which have thence the name of Galvaniſm, that animal fleſh, and particularly perhaps the nerves of animals, both which are compoſed of much carbon and water, are the moſt perfect conductors yet diſcovered; that is, that they give the leaſt reſiſtance to the junction of the ſpontaneous electric atmoſpheres, which exiſt round metallic bodies, and which differ very little in reſpect to the proportions of their vitreous and reſinous ingredients.

Thus alſo, though where the accumulated electricities are denſe, as in charging a coated glaſs-jar, the glaſs, which intervenes, may be of conſiderable thickneſs, and may ſtill become charged by the ſtronger attraction of the ſecondary electric ethers; but where the ſpontaneous adheſive electric atmoſpheres are employed to charge plates of air, as in the Galvanic pile, or probably to charge thin animal membranes or cuticles, as perhaps in the ſhock given by the torpedo or gymnotus, it ſeems neceſſary that the intervening nonconducting plate muſt be extremely thin, that it may become charged by the weaker attraction of theſe ſmall quantities or difference of the ſpontaneous electric atmoſpheres; and in this circumſtance only, I ſuppoſe the ſhocks from the Galvanic pile, and from the torpedo and gymnotus, differ from thoſe of the coated jar.

3. When atmoſpheres of electricity, which do not differ much in the quantity or proportion of

their vitreous and reſinous ethers, approach each other, they are not eaſily or rapidly united; but the predominant vitreous or reſinous ether of one of them repels the ſimilar ether of the oppoſed atmoſphere, and attracts the contrary kind of ether.

The ſlowneſs or difficulty with which atmoſpheres, which differ but little in kind or in denſity, unite with each other, appears not only from the experiment of Mr. Canton above related, but alſo from the repeated ſmaller ſhocks, which may be taken from a charged coated jar after the firſt or principal diſcharge, if the conducting medium has not been quickly removed, as is alſo mentioned above.

Hence thoſe atmoſpheres of either kind of electric matter, which differ but very little from each other in kind or quantity, require the moſt perfect conductors to cauſe them to unite. Thus it appears by Mr. Bennet's doubler, as mentioned in the Preliminary Propoſition, No. VI that the natural adheſive atmoſphere round ſilver contains more vitreous electricity than that naturally round zinc; but when thin plates of theſe metals, each about an ounce in weight, are laid on each other, or moderately preſſed together, their atmoſpheres do not unite. For metallic plates, which when laid on each other, do not adhere, cannot be ſaid to be in real contact, of which their not adhering is a proof; and in conſequence a thin plate of air, or of their own repulſive ethers exiſts between them.

Hence when two plates of zinc and ſilver are thus brought into the vicinity of each other, the plate of air between them, as they are not in adheſive contact, becomes like a charged coated jar; and if theſe two metallic plates are touched by your dry hands, they do not unite their electricities, as the dry cuticle is not a ſufficiently good conductor; but if one of the metals be put above, and another under the tongue, the ſaliva and moiſt mucous membrane, muſcular fibres, and nerves, ſupply ſo good a conductor, that this very minute electric ſhock is produced, and a kind of pungent taſte is perceived.

When a plate or pencil of ſilver is put between the upper lip and the gum, and a plate or pencil of zinc under the tongue, a ſenſation of light is perceived in the eyes, as often as the exterior extremities of theſe metals are brought into contact; which is owing in like manner to the diſcharge of a very minute electric ſhock, which would not have been produced but by the intervention of ſuch good conductors as moiſt membranes, muſcular fibres, and nerves.

In this ſituation, a ſenſation of light is produced in the eyes; which ſeems to ſhow, that theſe ethers paſs through nerves more eaſily, than through muſcular fleſh ſimply; ſince the paſſage of them through the retina of the eyes from the upper gum to the parts beneath the tongue is a more diſtant one, than would otherwiſe appear neceſſary. It is not ſo eaſy to give the ſenſation of light in the eyes by paſſing a ſmall ſhock of artificially accumulated electricity through the eyes (though this may, I believe, be done) becauſe this artificial accumulated electricity, as it paſſes with greater velocity than the ſpontaneous accumulations of it, will readily permeate the muſcles or other moiſt parts of animal bodies; whereas the ſpontaneous accumulations of electricity ſeem to require the beſt of all conductors, as animal nerves, to facilitate their paſſage.

4. In the Galvanic pile of Volta this electric ſhock becomes ſo much increaſed, as to paſs by leſs perfect conductors, and to give ſhocks to the arms of the conducting perſon, if the cuticle of his hands be moiſtened, and even to ſhow ſparks like the coated jar; which appears to be affected in this manner. When a plate of ſilver is laid horizontally on a plate of zinc, the plate of air between them becomes charged like a coated jar; as the ſilver, naturally poſſeſſing more vitreous electric ether, repels the vitreous ether, which the zinc poſſeſſes in leſs quantity, and attracts the reſinous ether of the zinc. Whence the inferior ſurface of the plate of zinc abounds now with vitreous ether, and its upper ſurface with reſinous ether. Beneath this pair of plates lay a cloth moiſtened with water, or with ſome better conductor, as ſalt and water, or a ſlight acid mixed with water or volatile alcali of ammoniac mixed with water, and this vitreous electric ether on the lower ſurface of the zinc plate will

be given to the ſecond ſilver plate which lies beneath it; and thus this ſecond ſilver plate will poſſeſs not only its own natural vitreous atmoſphere, which was denſer or in greater quantity than that of the zinc plate next beneath it, but now acquires an addition of vitreous ether from the zinc plate above it, conducted to it through the moiſt cloth.

This then will repel more vitreous ether from the ſecond zinc plate into the third ſilver one; and ſo on till the plates of air between the zincs and ſilvers are all charged, and each ſtronger and ſtronger, as they deſcend in the pile.

If the reader ſtill prefers the Franklinian theory of poſitive and negative electricity, he will pleaſe to put the word poſitive for vitreous, and negative for reſinous, and he will find the theory of the Galvanic pile equally thus accounted for.

5. When a Galvanic pile is thus placed, and a communication between the two ends of it is made by wires, ſo that the electric ſhocks paſs through water, the water becomes decompoſed in ſome meaſure, and oxygen is liberated from it at the point of one wire, and hydrogen at the point of the other; and this though a ſyphon of water be interpoſed between them. This curious circumſtance ſeems to evince the exiſtence of two electric ethers, which enter the water at different ends of the ſyphon, and have chemical affinities to the component parts of it; the reſinous ether ſets at

liberty the hydrogen at one end, and the vitreous ether the oxygen at the other end of the conducting medium.

Hence it muſt appear, that the longer the Galvanic pile, or the greater the number of the alternate pieces of ſilver and zinc that it conſiſts of, the ſtronger will be the Galvanic ſhock; but there is another circumſtance difficult to explain, which is the perpetual decompoſition of water by the Galvanic pile; when water is made the conducting medium between the two extremities of the pile.

As no conductors of electricity are abſolutely perfect, there muſt be produced a certain accumulation of vitreous ether on one ſide of each charged plate of the Galvanic pile, and of reſinous ether on the other ſide of it, before the diſcharge takes place, even though the conducting medium be in apparent contact. When the diſcharge does take place, the whole of the accumulated electricity explodes and vaniſhes; and then an inſtant of time is required for the ſilver and zinc again to attract from the air, or other bodies in their vicinity, their ſpontaneous natural atmoſpheres, and then another diſcharge enſues; and ſo repeatedly and perpetually till the ſurface of one of the metallic plates becomes ſo much oxydated or calcined, that it ceaſes to act.

Hence a perpetual motion may be ſaid to be produced, with an inceſſant decompoſition of water into the two gaſſes of oxygen and hydrogen; which muſt probably be conſtantly proceeding on all moiſt ſurfaces, where a chain of electric conductors exiſts, ſurrounded with different proportions of the two electric ethers. Whence the ceaſeleſs liberation of oxygen from the water has oxydated or calcined the ores of metals near the ſurface of the earth, as of manganeſe, of zinc into lapis calaminaris, of iron into various ochres, and other calciform ores. From this ſource alſo the corroſion of ſome metals may be traced, when they are immerſed in water in the vicinity of each other, as when the copper ſheathing of ſhips was held on by iron nails. And hence another great operation of nature is probably produced, I mean the reſtoration of oxygen to the atmoſphere from the ſurface of the earth in dewy mornings, as well as from the perſpiration of vegetable leaves; which atmoſpheric oxygen is hourly deſtructible by the reſpiration of animals and plants, by combuſtion, and by other oxydations.

6. The combination of the electric ethers with metallic bodies before mentioned appears from the Galvanic pile; ſince, according to the experiments of Mr. Davy, when an acid is mixed with the water placed between the alternate pairs of ſilver and zinc plates, a much greater electric ſhock is produced by the ſame pile; and an anonymous writer in the Phil. Magaz. No. 36, for May 1801, aſſerts, that when the intervening cloths or papers are moiſtened with pure alcali, as a ſolution of pure ammonia, the effect is greater than by any other material.

It muſt here be obſerved, that both the acid and the alcaline ſolution, or common ſalt and water, and even water alone, in theſe experiments much erodes the plates of zinc, and ſomewhat tarniſhes thoſe of ſilver. Whence it would appear, that as by the repeated exploſions of the two electric ethers in the conducting water, both oxygen and hydrogen are liberated; the oxygen erodes the zinc plates, and thus increaſes the Galvanic ſhock by liberating their combined electric ethers: and that this eroſion is much increaſed by a mixture either of acid or of volatile alcali with the water. Further experiments are wanting on this ſubject to ſhow whether metallic bodies emit either or both of the electric ethers at the time of their ſolution or eroſion in acids or in alcalies.

X. OF THE TWO MAGNETIC ETHERS.

1. Magnetiſm coincides with electricity in ſo many important points, that the exiſtence of two magnetic ethers, as well as of two electric ones, becomes highly probable. We ſhall ſuppoſe that in a common bar of iron or ſteel the two magnetic ethers exiſt intermixed or in their neutral ſtate; which for the greater eaſe of ſpeaking of them may be called arctic ether and antarctic ether; and in this ſtate like the two electric fluids they are not cognizable by our ſenſes or experiments.

When theſe two magnetic ethers are ſeparated from each other, and the arctic ether is accumulated on one end of an iron or ſteel bar, which is then called the north pole of the magnet, and the antarctic ether is accumulated on the other end of the bar, and is then termed the ſouth pole of the magnet; they become capable of attracting other pieces of iron or ſteel, and are thus cognizable by experiments.

It ſeems probable, that it is not the magnetic ether itſelf which attracts or repels particles of iron, but that an attractive and repulſive ether attends the magnetic ethers, as was ſhown to attend the electric ones in No. II. 9. of this Note; becauſe magnetiſm does not paſs through other bodies, as it does not eſcape from magnetiſed ſteel when in contact with other bodies; juſt as the electric fluids do not paſs through glaſs, but the attractive and repellent ethers, which attend both the magnetic and electric ethers, paſs through all bodies.

2. The prominent articles of analogical coincidence between magnetiſm and electricity are firſt, that when one end of an iron bar poſſeſſes an accumulation of arctic magnetic ether, or northern polarity; the other end poſſeſſes an accumulation of antarctic magnetic ether, or ſouthern polarity; in the ſame manner as when vitreous electric ether is accumulated on one ſide of a coated glaſs jar, reſinous electric ether becomes accumulated on the

other ſide of it; as the vitreous and reſinous ethers ſtrongly attract each other, and ſtrongly repel the ethers of the ſame denomination, but are prevented from intermixing by the glaſs plane between them; ſo the arctic and antarctic ethers attract each other, and repel thoſe of ſimilar denomination, but are prevented from intermixing by the iron or ſteel being a bad conductor of them; they will, nevertheleſs, ſooner combine, when the bar is of ſoft iron, than when it is of hardened ſteel; and then they ſlowly combine without exploſion, that is, without emitting heat and light like the electric ethers, and therefore reſemble a mixture of oxygen and pure ammonia; which unite ſilently producing a neutral fluid without emitting any other fluids previouſly combined with them.

Secondly, If the north pole of a magnetic bar be approached near to the eye of a ſewing needle, the arctic ether of the magnet attracts the antarctic ether, which reſides in the needle towards the eye of it, and repels the arctic ether, which reſides in the needle towards the point, preciſely in the ſame manner as occurs in preſenting an electriſed glaſs tube, or a rubbed ſtick of ſealing wax to one extremity of two ſkewers inſulated horizontally on wine-glaſſes in the experiment aſcribed to Mr. Canton, and deſcribed in No. IX. 1, of this Additional Note, and alſo ſo exactly reſembles the method of producing a ſeparation and conſequent accumulation of the two electric ethers by preſſing a cuſhion on glaſs or on ſealing wax, deſcribed in No. 4 of this Note, that their analogy is evidently apparent.

Thirdly, When much accumulated electricity is approached to one end of a long glaſs tube by a charged prime conductor, there will exiſt many diviſions of the vitreous and reſinous electricity alternately; as the vitreous ether attracts the reſinous ether from a certain diſtance on the ſurface of the glaſs tube, and repels the vitreous ether; but, as this ſurface is a bad conductor, theſe reciprocal attractions and repulſions do not extend very far along it, but ceaſe and recur in various parts of it. Exactly ſimilar to this, when a magnetic bar is approximated to the end of a common bar of iron or ſteel, as deſcribed in Mr. Cavallo's valuable Treatiſe on Magnetiſm; the arctic ether of the north pole of the magnetic bar attracts the antarctic ether of the bar of common iron towards the end in contact, and repels the arctic ether; but, as iron and ſteel are as bad conductors of magnetiſm, as glaſs is of electricity, this accumulation of arctic ether extends but a little way, and then there exiſts an accumulation of antarctic ether; and thus reciprocally in three or four diviſions of the bar, which now becomes magnetiſed, as the glaſs tube became electriſed.

Another ſtriking feature, which ſhows the ſiſterhood of electricity and magnetiſm, conſiſts in the origin of both of them from the earth, or common maſs of matter. The eduction of electricity from the earth is ſhown by an inſulated cuſhion ſoon ceaſing to ſupply either the vitreous or reſinous ether to the whirling globe of glaſs or of ſulphur; the eduction of magnetiſm from the earth appears from the following experiment: if a bar of iron be ſet upright on the earth in this part of the world, it becomes in a ſhort time magnetical; the lower end poſſeſſing northern polarity, or arctic ether, and the higher end in conſequence poſſeſſing ſouthern polarity or antarctic ether; which may be well explained, if we ſuppoſe with Mr. Cavallo, that the earth itſelf is one great magnet, with its ſouthern polarity or antarctic ether at the northern end of its axis; and, in conſequence, that it attracts the arctic ether of the iron bar into that end of it which touches the earth, and repels the antarctic ether of the iron bar to the other end of it, exactly the ſame as when the ſouthern pole of an artificial magnet is brought into contact with one end of a ſewing needle.

3. The magnetic and electric ethers agree in the characters above mentioned, and perhaps in many others, but differ in the following ones. The electric ethers paſs readily through metallic, aqueous and carbonic bodies, but do not permeate vitreous or reſinous ones; though on the ſurfaces of theſe they are capable of adhering, and of being accumu-

lated by the approach or contact of other bodies; while the magnetic ethers will not permeate any bodies, and are capable of being accumulated only on iron and ſteel by the approach or contact of natural or artificial magnets, or of the earth; at the ſame time the attractive and repulſive powers both of the magnetic and electric ethers will act through all bodies, like thoſe of gravitation and heat.

Secondly, The two electric ethers ruſh into combination, when they can approach each other, after having been ſeparated and condenſed, and produce a violent exploſion, emitting the heat and light, which were previouſly combined with them; whereas the two magnetic ethers ſlowly combine, after having been ſeparated and accumulated on the oppoſite ends of a ſoft iron bar, and without emitting heat and light produce a neutral mixture, which, like the electric combination, ceaſes to be cognizable by our ſenſes or experiments.

Thirdly, The wonderful property of the magnetic ethers, when ſeparately accumulated on the ends of a needle, endeavouring to approach the two oppoſite poles of the earth; nothing ſimilar to which has been obſerved in the electric ethers.

From theſe ſtrict analogies between electricity and magnetiſm, we may conclude that the latter conſiſts of two ethers as well as the former; and that they both, when ſeparated by art or nature, combine by chemical affinity when they approach, the one exploding, and then conſiſting of a reſiduum after having emitted heat and light; and the other producing ſimply a neutraliſed fluid by their union.

XI. CONCLUSION.

1. When two fluids are diffuſed together without undergoing any change of their chemical properties, they are ſaid ſimply to be mixed, and not combined as milk and water when poured together, or as oxygen and azote in the common atmoſphere. So when ſalt or ſugar is diffuſed in water, it is termed ſolution, and not combination; as no change of their chemical properties ſucceeds.

But when an acid is mixed with a pure alcali a combination is produced, and the mixture is ſaid to become neutral, as it does not poſſeſs the chemical properties which either of the two ingredients poſſeſſed in their ſeparate ſtate, and is therefore ſimilar to neither of them. But when a carbonated alcali, as mild ſalt of tartar, is mixed with a mineral acid, they preſently combine as above, but now the carbonic acid flies forcibly away in the form of gas; this, therefore may be termed a kind of exploſion, but cannot properly be ſo called, as the ethereal fluids of heat and light are not principally emitted, but an ærial one or gas; which may probably acquire a ſmall quantity of heat from the combining matters.

But when ſtrong acid of nitre is poured upon charcoal in fine powder, or upon oil of cloves, a a violent exploſion enſues, and the ethereal matters of heat and light are emitted in great abundance, and are diſſipated: while in the former inſtance the oxygen of the nitrous acid unites with the carbone forming carbonic acid gas, and the azote eſcapes in its gaſſeous form; which may be termed a reſiduum after the exploſion, and may be confined in a proper apparatus, which the heat and light cannot; for the former, if its production be great and ſudden burſts the veſſels, or otherwiſe it paſſes ſlowly through them; and the latter paſſes through tranſparent bodies, and combines with opake ones.

But where ethers only are concerned in an exploſion, as the two electric ones, which are previouſly difficult to confine in veſſels; the repulſive ethers of heat and light are given out; and what remains is a combination of the two electric ethers; which in this ſtate are attracted by all bodies, and form atmoſpheres round them.

Theſe combined electric atmoſpheres muſt poſſeſs leſs heat and light after their exploſion; which they ſeem afterwards to acquire at the time they are again ſeparated from each other, probably from the combined heat and combined light of the cuſhion and glaſs, or of the cuſhion and reſin; by the contact of which they are ſeparated and not from the diffuſed heat of them; but no experiments have yet been made to aſcertain this fact, this combination of the vitreous and reſinous ethers may be eſteemed the reſiduum after their exploſion.

2. Hence the eſſence of exploſion conſiſts in two bodies, which are previouſly united with heat and light, ſo ſtrongly attracting each other, as to ſet at liberty theſe two repulſive ethers; but it happens, that theſe exploſive materials cannot generally be brought into each other's vicinity in a ſtate of ſufficient denſity; unleſs they are alſo previouſly combined with ſome other material beſide the light and heat above ſpoken of: as in the nitrous acid, the oxygen is previouſly combined with azote; and is thus in a condenſed ſtate, before it is brought into the contact or vicinity of the carbone; there are however bodies which will ſlowly explode, or give out heat and light, without being previouſly combined with other bodies; as phoſphorus in the common atmoſphere, ſome dead fiſh in a certain degree of putridity, and ſome living inſects probably by their reſpiration in tranſparent lungs, which is a kind of combuſtion.

But the two electric ethers are condenſed by being brought into vicinity with each other with a non-conductor between them; and thus explode violently, as ſoon as they communicate, either by rupturing the interpoſed nonconductor, or by a metallic communication. This curious method of a previous condenſation of the two exploding matters, without either of them being combined with any other material except with the ethers of heat and light, diſtinguiſhes this ethereal exploſion from that of moſt other bodies; and ſeems to have been the cauſe, which prevented the ingenious Dr. Franklin, and others ſince his time, from aſcribing the powerful effects of the electric battery, and of lightning in burſting trees, inflaming combuſtible materials, and fuſing metals, to chemical exploſion; which it reſembles in every other circumſtance, but in the manner of the previous condenſation of the materials, ſo as violently to attract each other, and ſuddenly ſet at liberty the heat and light, with which one or both of them were combined.

3. This combination of vitreous and reſinous electric ethers is again deſtroyed or weakened by the attractions of other bodies; as they ſeparate entirely, or exiſt in different proportions, forming atmoſpheres round conducting and nonconducting bodies; and in this they reſemble other combinations of matters; as oxygen and azote, when united in the production of nitrous acid, are again ſeparated by carbone; which attracts the oxygen more powerfully than that attracts the azote, with which it is combined.

This mode of again ſeparating the combined electric ethers by preſſing them, as they ſurround bodies in different proportions, into each other's atmoſpheres, as by the glaſs and cuſhion, has not been obſerved reſpecting the decompoſition of other bodies; when their minute particles are brought ſo near together as to decompoſe each other; which has thence probably contributed to prevent this decompoſition of the two combined electric ethers from being aſcribed to chemical laws; but, as far as we know, the attractive and repulſive atmoſpheres round the minute particles of bodies in chemical operations may act in a ſimilar manner; as the attractive and repulſive atmoſpheres, which accompany the electric ethers ſurrounding the larger maſſes of matter, and that hence both the electric and the chemical exploſions are ſubject to the ſame laws, and alſo the decompoſition again of thoſe particles, which were combined in the act of exploſion.

4. It is probable that this theory of electric and magnetic attractions and repulſions, which ſo viſibly exiſt in atmoſpheres round larger maſſes of matter, may be applied to explain the inviſible attractions and repulſions of the minute particles of bodies in chemical combinations and decompoſitions, and alſo to give a clear idea of the attractions of the great maſſes of matter, which form the gravitations of the univerſe.

We are ſo accuſtomed to ſee bodies attract each other, when they are in abſolute contact, as dew drops or particles of quickſilver forming themſelves into ſpheres, as water riſing in capillary tubes, the ſolution of ſalts and ſugar in water, and the coheſion with which all hard bodies are held together, that we are not ſurpriſed at the attractions of bodies in contact with each other, but aſcribe them to a law affecting all matter. In ſimilar manner when two bodies in apparent contact repel each other, as oil thrown on water; or when heat converts ice into water and water into ſteam; or when one hard body in motion puſhes another hard body out of its place; we feel no ſurpriſe, as theſe events ſo perpetually occur to us, but aſcribe them as well as the attractions of bodies in contact with each other, to a general law of nature.

But when diſtant bodies appear to attract or repel each other, as we believe that nothing can act where it does not exiſt, we are ſtruck with aſtoniſhment; which is owing to our not ſeeing the intermediate ethers, the exiſtence of which is aſcertained by the electric and magnetic facts above related.

From the facts and obſervations above mentioned electricity and magnetiſm conſiſt each of them of two ethers, as the vitreous and reſinous electric ethers, and the arctic and antarctic magnetic ethers. But as neither of the electric ethers will paſs through glaſs or reſin; and as neither of the magnetic ethers will paſs through any bodies except iron; and yet the attractive and repulſive powers accompanying all theſe ethers permeate bodies of all kinds; it follows, that ethers more ſubtile than either the electric or magnetic ones attend thoſe ethers forming atmoſpheres round them; as thoſe electric and magnetic ethers themſelves form atmoſpheres round other bodies.

This ſecondary atmoſphere of the electric one appears to conſiſt of two ethers, like the electric one which it ſurrounds; but theſe ethers are probably more ſubtile as they permeate all bodies; and when they unite by the reciprocal approach of the bodies which they ſurround, they do not appear to emit heat and light, as the primary electric atmoſpheres do; and therefore they are ſimpler fluids, as they are not previouſly combined with heat and light. The ſecondary magnetic atmoſpheres are alſo probably more ſubtile or ſimple than the primary ones.

Hence we may ſuppoſe, that not only all the larger inſulated maſſes of matter, but all the minute particles alſo, which conſtitute thoſe maſſes, are ſurrounded by two ethereal fluids; which like the electric and magnetic ones attract each other forcibly, and as forcibly repel thoſe of the ſame denomination; and at the ſame time ſtrongly adhere to the bodies, which they ſurround. Secondly that theſe ethers are of the finer kind, like thoſe ſecondary ones, which ſurround the primary electric and magnetic ethers; and that therefore they do not explode giving out heat and light when they unite, but ſimply combine, and become neutral; and laſtly, that they ſurround different bodies in different proportions, as the vitreous and reſinous electric ethers were ſhown to ſurround ſilver and zinc and many other metals in different proportions in No. IX. of this note.

5. For the greater eaſe of converſing on this ſub-

ject, we ſhall call theſe two ethers, with which all bodies are ſurrounded, the maſculine and the feminine ethers; and ſuppoſe them to poſſeſs the properties above mentioned. We ſhould here however previouſly obſerve, that in chemical proceſſes it is neceſſary, that the bodies, which are to combine or unite with each other, ſhould be in a fluid, ſtate, and the particles in contact with each other; thus when ſalt is diſſolving in water, the particles of ſalt unite with thoſe of the water, which touch them; theſe particles of water become ſaturated, and thence attract ſome of the ſaline particles with leſs force; which are therefore attracted from them by thoſe behind; and the firſt particles of water, are again ſaturated from the ſolid ſalt; or in ſome ſimilar proceſſes the ſaturated combinations may ſubſide or evaporate, as in the union of the two electric ethers, or in the exploſion of gun-powder, and thus thoſe in their vicinity may approach each other. This neceſſity of a liquid form for the purpoſe of combination appears in the lighting of gunpowder, as well as in all other combuſtion, the ſpark of fire applied diſſolves the ſulphur, and liquifies the combined heat; and by theſe means a fluidity ſucceeds, and the conſequent attractions and repulſions, which form the exploſion.

The whole mixed maſs of matter, of which the earth is compoſed, we ſuppoſe to be ſurrounded and penetrated by the two ethers, but with a greater proportion of the maſculine ether than of the feminine. When a ſtone is elevated above the ſurface of the earth, we ſuppoſe it alſo to be ſurrounded with an atmoſphere of the two ethers, but with a greater proportion of the feminine than of the maſculine, and that theſe ethers adhere ſtrongly by coheſion both to the earth and to the ſtone elevated above it. Now the greater quantity of the maſculine ether of the earth becomes in contact with the greater quantity of the feminine ether of the ſtone above it; which it powerfully attracts, and at the ſame time repels the leſs quantity of the maſculine ether of the ſtone. The reciprocal attractions of theſe two fluids, if not reſtrained by counter attractions, bring them together as in chemical combination, and thus they bring together the ſolid bodies, which they reciprocally adhere to; if they be not immoveable; which ſolid bodies, when brought into contact, cohere by their own reciprocal attractions, and hence the myſterious affair of diſtant attraction or gravitation becomes intelligible, and conſonant to the chemical combinations of fluids.

To further elucidate theſe various attractions, if the patient reader be not already tired, he will pleaſe to attend to the following experiment: let a bit of ſponge ſuſpended on a ſilk line be moiſtened with a ſolution of pure alcali, and another ſimilar piece of ſponge be moiſtened with a weak acid, and ſuſpended near the former; electriſe one of them with vitreous ether, and the other with reſinous ether; as they hang with a thin plate of glaſs between them: now as theſe two electric ethers appear to attract each other without intermixing; as neither of them can paſs through glaſs; they muſt be themſelves ſurrounded with ſecondary ethers, which paſs through the glaſs, and attract each other, as they become in contact; as theſe ſecondary ethers adhere to the primary vitreous and reſinous ethers, theſe primary ones are drawn by them into each other's vicinity by the attraction of coheſion, and become condenſed on each ſide of the glaſs plane; and then when the glaſs plane is withdrawn, the two electric ethers being now in contact ruſh violently together, and draw along with them the pieces of moiſtened ſponge, to which they adhere; and finally the acid and alcaline liquids being now brought into contact combine by their chemical affinity.

The repulſions of diſtant bodies are alſo explicable by this idea of their being ſurrounded with two ethers, which we have termed maſculine and feminine for the caſe of converſing about them; and have compared them to vitreous and reſinous electricity, and to arctic and antarctic magnetiſm. As when two particles of matter, or two larger maſſes of it, are ſurrounded both with their maſculine ethers, theſe ethers repel each other or refuſe to intermix; and in conſequence the bodies to which they adhere, recede from each other; as two cork-balls ſuſpended near each other, and electriſed both with vitreous or both with reſinous ether, repel each other; or as the extremities of two needles magnetiſed both with arctic, or both with antarctic ether, repel each other; or as oil and water ſurrounded both with their maſculine, or both with their feminine ethers, repel each other without touching; ſo light is believed to be reflected from a mirror without touching its ſurface, and to be bent towards the edge of a knife, or refracted by its approach from a rarer medium into a denſer one, by the repulſive ether of the mirror, and the attractive ones of the knife-edge, and of the denſer medium. Thus a poliſhed tea-cup ſlips on the poliſhed ſaucer probably without their actual contact with each other, till a few drops of water are interpoſed between them by capillary attraction, and prevent its ſliding by their tenacity. And ſo, laſtly, one hard body in motion puſhes another hard body out of its place by their repulſive ethers without being in contact; as appears from their not adhering to each other, which all bodies in real contact are believed to do. Whence alſo may be inferred the reaſon why bodies have been ſuppoſed to repel at one diſtance and attract at another, becauſe they attract when their particles are in contact with each other, and either attract or repel when at a diſtance by the intervention of their attractive or repulſive ethers.

Thus have I endeavoured to take one ſtep further back into the myſtery of the gravitation and repulſion of bodies, which appeared to be diſtant from each other, as of the ſun and planets, as I before endeavoured to take one ſtep further back into the myſteries of generation in my account of the production of the buds of vegetables in Phytologia. With what ſucceſs theſe have been attended I now leave to the judgment of philoſophical readers, from which I can make no appeal.

NOTE XIII.—ANALYSIS OF TASTE.

Fond Fancy's eye recalls the form divine,
And Taſte ſits ſmiling upon Beauty's ſhrine.
Canto III. l. 221.

The word Taſte in its extenſive application may expreſs the pleaſures received by any of our ſenſes, when excited into action by the ſtimulus of external objects; as when odours ſtimulate the noſtrils, or flavours the palate; or when ſmoothneſs, or ſoftneſs, are perceived by the touch, or warmth by its adapted organ of ſenſe. The word Taſte is alſo uſed to ſignify the pleaſurable trains of ideas ſuggeſted by language, as in the compoſitions of poetry and oratory. But the pleaſures conſequent to the exertions of our ſenſe of viſion only, are deſigned here to be treated of, with occaſional references to thoſe of the ear, when they elucidate each other.

When any of our organs of ſenſe are excited into their due quantity of action, a pleaſurable ſenſation ſucceeds, as ſhown in Zoonomia, Vol. I. Sect. IV. Theſe are ſimply the pleaſures attending perception, and not thoſe which are termed the pleaſures of Taſte; which conſiſt of additional pleaſures ariſing from the peculiar forms or colours of objects, or of their peculiar combinations or ſucceſſions, or from other agreeable trains of ideas previouſly aſſociated with them.

There are four ſources of pleaſure attendant on the excitation of the nerves of viſion by light and colours, beſides that ſimply of perception above mentioned; the firſt is derived from a degree of novelty of the forms, colours, numbers, combinations, or ſucceſſions and viſible objects. The ſecond is derived from a degree of repetition of their forms, colours, numbers, combinations, or ſucceſſions. Where theſe two circumſtances exiſt united in certain quantities, and compoſe the principal part of a landſcape, it is termed pictureſque by modern writers. The third ſource of pleaſure from the perception of the viſible world may be termed the melody of colours, which will be ſhown to coincide with melody of ſounds: this circumſtance may alſo accompany the pictureſque, and will add to the pleaſure it affords. The fourth ſource of pleaſure from the perception of viſible objects is derived from the previous aſſociation of other pleaſurable trains of ideas with certain forms, colours, combinations, or ſucceſſions of them. Whence the beautiful, ſublime, romantic, melancholic, and other emotions, which have not acquired names to expreſs them. We may add, that all theſe four ſources of pleaſure from perceptions are equally applicable to thoſe of ſounds as of ſights.

I. NOVELTY OR INFREQUENCY OF VISIBLE OBJECTS.

The firſt circumſtance, which ſuggeſts an additional pleaſure in the contemplation of viſible objects, beſides that of ſimple perception, ariſes from their novelty or infrequency; that is from the unuſual combinations or ſucceſſions of their forms or colours. From this ſource is derived the perpetual cheerfulneſs of youth, and the want of it is liable to add a gloom to the countenance of age. It is this which produces variety in landſcape compared with the common courſe of nature, an intricacy which incites inveſtigation, and a curioſity which leads to explore the works of nature. Thoſe who travel into foreign regions inſtigated by curioſity, or who examine and unfold the intricacies of ſciences at home, are led by novelty; which not only ſupplies ornament to beauty or to grandeur, but adds agreeable ſurpriſe to the point of the epigram. and to the double meaning of the pun, and is courted alike by poets and philoſophers.

It ſhould be here premiſed, that the Novelty, as uſed in theſe pages, admits of degrees or quantities, ſome objects, or the ideas excited by them, poſſeſſing more or leſs novelty, as they are more or leſs unuſual. Which the reader will pleaſe to attend to, as we have uſed the word Infrequency of objects, or the ideas excited by them, to expreſs the degrees or quantities of their novelty.

The ſource, from which is derived the pleaſure of novelty, is a metaphyſical inquiry of great curioſity, and will on that account excuſe my here introducing it. In our waking hours whenever an idea occurs, which is incongruous to our former experience, we inſtantly diſſever the train of imagination by the power of volition; and compare the incongruous idea with our previous knowledge of nature, and reject it. This operation of the mind has not yet acquired a ſpecific name, though it is exerted every minute of our waking hours, unleſs it may be termed INTUITIVE ANALOGY. It is an act of reaſoning of which we are unconſcious except by its effects in preſerving the congruity of our ideas; Zoonomia, Vol. I. Sect. XVII. 3. 7.

In our ſleep as the power of volition is ſuſpended, and conſequently that of reaſon, when any incongruous ideas occur in the trains of imagination, which compoſe our dreams; we cannot compare them with our previous knowledge of nature and reject them; whence ariſes the perpetual inconſiſtency of our ſleeping trains of ideas; and whence in our dreams we never feel the ſentiment of novelty; however different the ideas, which preſent themſelves, may be from the uſual courſe of nature.

But in our waking hours, whenever any object occurs which does not accord with the uſual courſe of nature, we immediately and unconſciouſly exert our voluntary power, and examine it by intuitive analogy, comparing it with our previous knowledge of nature. This exertion of our volition excites many other ideas, and is attended with pleaſurable ſenſation; which conſtitutes the ſentiment of novelty. But when the object of novelty ſtimulates us ſo forcibly as ſuddenly to diſunite our paſſing trains of ideas, as if a piſtol be unexpectedly diſcharged, the emotion of ſurpriſe is experienced; which by exciting violent irritation and violent ſenſation, employs for a time the whole ſenſorial energy, and thus diſſevers the paſſing trains of ideas, before the power of volition has time to compare them with the uſual phenomena of nature; but as the painful emotion of fear is then generally added to that of ſurpriſe, as every one experiences, who hears a noiſe in the dark, which he cannot immediately account for; this great degree of novelty, when it produces much ſurpriſe, generally ceaſes to be pleaſurable, and does not then belong to objects of taſte.

In its leſs degree ſurpriſe is generally agreeable, as it ſimply expreſſes the ſentiment occaſioned by the novelty of our ideas; as in common language we ſay, we are agreeably ſurpriſed at the unexpected meeting with a friend, which not only expreſſes the ſentiment of novelty, but alſo the pleaſure from other agreeable ideas aſſociated with the object of it.

It muſt appear from hence, that different perſons muſt be affected more or leſs agreeably by different degrees or quantities of novelty in the objects of taſte; according to their previous knowledge of nature, or their previous habits or opportunities of attending to the fine arts. Thus before its nativity the fetus experiences the perceptions of heat and cold, of hardneſs and ſoftneſs, of motion and reſt, with thoſe perhaps of hunger and repletion, ſleeping and waking, pain and pleaſure; and perhaps ſome other perceptions, which may at this early time of its exiſtence have occaſioned perpetual trains of ideas. On its arrival into the world the perceptions of light and ſound muſt by their novelty at firſt diſſever its uſual trains of ideas and occaſion great ſurpriſe; which after a few repetitions will ceaſe to be diſagreeable, and only excite the emotion from novelty, which has not acquired a ſeparate name, but is in reality a leſs degree of ſurpriſe; and by further experience the ſentiment of novelty, or any degree of ſurpriſe, will ceaſe to be excited by the ſounds or ſights, which at firſt excited perhaps a painful quantity of ſurpriſe.

It ſhould here be obſerved, that as the pleaſure of novelty is produced by the exertion of our voluntary power in comparing uncommon objects with thoſe which are more uſually exhibited; this ſentiment of novelty is leſs perceived by thoſe who do not readily uſe the faculty of volition, or who have little previous knowledge of nature, as by very ignorant or very ſtupid people, or by brute animals; and that therefore to be affected with this circumſtance of the objects of Taſte requires ſome previous knowledge of ſuch kinds of objects, and ſome degree of mental exertion.

Hence when a greater variety of objects than uſual is preſented to the eye, or when ſome intricacy of forms, colours, or reciprocal locality more than uſual accompanies them, it is termed novelty if it only excites the exertion of intuitive compariſon with the uſual order of nature, and affects us with pleaſurable ſenſation; but is termed ſurpriſe, if it ſuddenly diſſevers our accuſtomed habits of motion, and is then more generally attended with diſagreeable ſenſation. To this circumſtance attending objects of taſte is to be referred what is termed wild and irregular in landſcapes, in contradiſtinction to the repetition of parts or uniformity ſpoken of below. We may add, that novelty of notes and tones in muſic, or of their combinations or ſucceſſions, are equally agreeable to the ear, as the novelty of forms and colours, and of their combinations or ſucceſſions are to the eye; but that the greater quantity or degree of novelty, the ſentiment of which is generally termed Surpriſe, is more frequently excited by unuſual or unexpected ſounds; which are liable to alarm us with fear, as well as ſurpriſe us with novelty.

REPETITION OF VISIBLE OBJECTS.

The repeated excitement of the ſame or ſimilar ideas with certain intervals of time, or diſtances of ſpace between them, is attended with agreeable ſenſations, beſides that ſimply of perception; and, though it appears to be diametrically oppoſite to the pleaſure ariſing from the novelty of objects above treated of, enters into the compoſitions of all the agreeable arts.

The pleaſure ariſing from the repetition of ſimilar ideas with certain intervals of time or diſtances of ſpace between them is a ſubject of great metaphyſical curioſity, as well as the ſource of the pleaſure derived from novelty, which will I hope excuſe its introduction in this place.

The repetitions of motions may be at firſt produced either by volition, or by ſenſation, or by irritation, but they ſoon become eaſier to perform than any other kinds of action, becauſe they ſoon become aſſociated together; and thus their frequency of repetition, if as much ſenſorial power be produced during every reiteration, as is expended, adds to the facility of their production.

If a ſtimulus be repeated at uniform intervals of time, the action, whether of our muſcles or organs of ſenſe, is produced with ſtill greater facility or energy; becauſe the ſenſorial power of aſſociation, mentioned above, is combined with the ſenſorial power of irritation; that is, in common language, the acquired habit aſſiſts the power of the ſtimulus.

This not only obtains in the annual, lunar, and diurnal catenations of animal motions, as explained in Zoonomia, Sect. XXXVI. which are thus performed with great facility and energy; but in every leſs circle of actions or ideas, as in the burden of a ſong, or the reiterations of a dance. To the facility and diſtinctneſs with which we hear ſounds at repeated intervals, we owe the pleaſure, which we receive from muſical time, and from poetic time, as deſcribed in Botanic Garden, V. II. Interlude III. And to this the pleaſure we receive from the rhimes and alliterations of modern verſification; the ſource of which without this key would be difficult to diſcover.

There is no variety of notes referable to the gamut in the beating of a drum, yet if it be performed in muſical time, it is agreeable to our ears; and therefore this pleaſurable ſenſation muſt be owing to the repetition of the diviſions of the ſounds at certain intervals of time, or muſical bars. Whether theſe times or bars are diſtinguiſhed by a pauſe, or by an emphaſis, or accent, certain it is, that this diſtinction is perpetually repeated; otherwiſe the ear could not determine inſtantly, whether the ſucceſſions of ſound were in common or in triple time.

But beſides theſe little circles of muſical time, there are the greater returning periods, and the ſtill more diſtinct choruſſes; which, like the rhimes at the end of verſes, owe their beauty to repetition; that is, to the facility and diſtinctneſs with which we perceive ſounds, which we expect to perceive or have perceived before; or in the language of this work, to the greater eaſe and energy with which our organ is excited by the combined ſenſorial powers of aſſociation and irritation, than by the latter ſingly.

This kind of pleaſure ariſing from repetition, that is from the facility and diſtinctneſs with which we perceive and underſtand repeated ſenſations, enters into all the agreeable arts; and when it is carried to exceſs is termed formality. The art of dancing like that of muſic depends, for a great part of the pleaſure it affords, on repetition; architecture, eſpecially the Grecian, conſiſts of one part being a repetition of another, and hence the beauty of the pyramidal outline in landſcape painting; where one ſide of the picture may be ſaid in ſome meaſure to balance the other. So univerſally does repetition contribute to our pleaſure in the fine arts, that beauty itſelf has been defined by ſome writers to conſiſt in a due combination of uniformity and variety: Zoonomia, Vol. I. Sect. XXII. 2, 1.

Where theſe repetitions of form, and reiterations of colour, are produced in a picture or a natural landſcape, in an agreeable quantity, it is termed ſimplicity, or unity of character; where the repetition principally is ſeen in the diſpoſition or locality of the diviſions, it is called ſymmetry, proportion, or grouping the ſeparate parts; where this repetition is moſt conſpicuous in the forms of viſible objects, it is called regularity or uniformity; and where it affects the colouring principally, the artiſts call it breadth of colour.

There is nevertheleſs, an exceſs of the repetition of the ſame or ſimilar ideas, which ceaſes to pleaſe, and muſt therefore be excluded from compoſitions of Taſte in painted landſcapes, or in ornamented gardens; which is then called formality, monotony, or inſipidity. Why the excitation of ideas ſhould give additional pleaſure by the facility and diſtinctneſs of their production for a certain time, and then ceaſe to give additional pleaſure; and gradually to give leſs pleaſure than that, which attends ſimple exertion of them; is another curious metaphyſical problem, and deſerves inveſtigation.

In our waking hours a perpetual voluntary exertion, of which we are unconſcious, attends all our new trains of ideas, whether thoſe of imagination or of perception; which by comparing them with our former experience preſerves the conſiſtency of the former, by rejecting ſuch as are incongruous; and adds to the credibility of the latter, by their analogy to objects of our previous knowledge: and this exertion is attended with pleaſurable ſenſation. After very frequent repetition theſe trains of ideas do not excite the exertion of this intuitive analogy, and in conſequence are not attended with additional pleaſure to that ſimply of perception; and by continued repetition they at length loſe even the pleaſure ſimply of perception, and thence finally ceaſe to be excited; whence one cauſe of the torpor of old age, and of death, as ſpoken of in Additional Note, No. VII. 3, of this work.

When there exiſts in any landſcape a certain number and diverſity of forms and colours, or of their combinations or ſucceſſions, ſo as to produce a degree of novelty; and that with a certain repetition, or arrangement of parts, ſo as to render them gradually comprehenſible or eaſily compared with the uſual courſe of nature; if this agreeable combination of viſible objects be on a moderate ſcale, in reſpect to magnitude, and form the principal part of the landſcape, it is termed PICTURESQUE by modern artiſts; and when ſuch a combination of forms and colours contains many eaſy flowing curves and ſmooth ſurfaces the delightful ſentiment of BEAUTY becomes added to the pleaſure of the Picturesque.

If the above agreeable combination of novelty and repetition exiſts on a larger ſcale with more projecting rocks, and deeper dells, and perhaps with a ſomewhat greater proportion of novelty than repetition, the landſcape aſſumes the name of ROMANTIC; and if ſome of theſe forms or combinations are much above the uſual magnitude of ſimilar objects, the more intereſting ſentiment of SUBLI-

MITY becomes mixed with the pleaſure of the romantic.

III. MELODY OF COLOURS.

A third ſource of pleaſure ariſing from the inſpection of viſible objects, beſides that of ſimple perception, ariſes from what may be termed melody of colours, as certain colours are more agreeable, when they ſucceed each other; or when they are diſpoſed in each other's vicinity, ſo as ſucceſſively to affect the organ of viſion.

In a paper on the colours ſeen in the eye after looking for ſome time on luminous objects, publiſhed by Dr. Darwin of Shrewſbury in the Philoſ. Tranſ. Vol. 76, it is evidently ſhown, that we ſee certain colours not only with greater eaſe and diſtinctneſs, but with relief and pleaſure, after having for ſome time inſpected other certain colours; as green after red, or red after green; orange after blue, or blue after orange; yellow after violet, or violet after yellow; this, he ſhows, ariſes from the ocular ſpectrum of the colour laſt viewed coinciding with the irritation of the colour now under contemplation.

Thus if you make a dot with ink in the centre of a circle of red ſilk the ſize of a letter-wafer, and place it on a ſheet of white paper, and look on it for a minute without moving your eyes; and then gently turn them on the white paper in its vicinity, or gently cloſe them, and hold one hand an inch or two before them, to prevent too much light from paſſing through the eyelids, a circular ſpot of pale green will be ſeen on the white paper or in the cloſed eye; which is called the ocular ſpectrum of the red ſilk, and is formed as Dr. Darwin ſhows by the pandiculation or ſtretching of the fine fibrils, which conſtitute the extremities of the optic nerve, in a direction contrary to that, in which they have been excited by previouſly looking at a luminous object, till they become fatigued; like the yawning or ſtretching of the larger muſcles after acting long in one direction.

If at this time the eye, fatigued by looking long at the centre of the red ſilk, be turned on paper previouſly coloured with pale green; the circular ſpot or ocular ſpectrum will appear of a much darker green; as now the irritation from the pale green paper coincides with the pale green ſpectrum remaining in the eye, and thus excites thoſe fibres of the retina into ſtronger action; on this account ſome colours are ſeen more diſtinctly, and conſequently more agreeably after others; or when placed in the vicinity of others; thus if orange-coloured letters are painted on a blue ground, they may be read at as great diſtance as black on white, perhaps at a greater.

The colours, which are thus more diſtinct when ſeen in ſucceſſion are called oppoſite colours by Sir Iſaac Newton in his optics, Book I. part 2, and may be eaſily diſcovered by any one, by the method above deſcribed; that is by laying a coloured circle of paper or ſilk on a ſheet of white paper, and inſpecting it ſome time with ſteady eyes, and then either gently cloſing them, or removing them on another part of the white paper, and the ocular ſpectrum or oppoſite colour becomes viſible in the eye.

Sir Iſaac Newton bas obſerved, that the breadths of the ſeven primary colours in the ſun's image refracted by a priſm, are proportioned to the ſeven muſical notes of the gamut, or to the intervals of the eight ſounds contained in an octave.

From this curious coincidence, it has been propoſed to produce a luminous muſic, conſiſting of ſucceſſions or combinations of colours, analagous to a tune in reſpect to the proportions above mentioned. This might be performed by a ſtrong light, made by means of Mr. Argand's lamps, paſſing through coloured glaſſes, and falling on a defined part of the wall, with moveable blinds before them, which might communicate with the keys of a harpſichord, and thus produce at the ſame time viſible and audible muſic in uniſon with each other.

Now as the pleaſure we receive from the ſenſation of mellodious notes, independent of muſical time, and of the previous aſſociations of agreeable ideas with them, muſt ariſe from our hearing ſome proportions of ſounds after others more eaſily, diſtinctly, or agreeably; and as there is a coincidence between the proportions of the primary colours, and the primary ſounds, if they may be ſo called; the ſame laws muſt probably govern the ſenſations of both. In this circumſtance therefore conſiſts the ſiſterhood of Muſic and Painting; and hence they claim a right to borrow metaphors from each other: muſicians to ſpeak of the brilliancy of ſounds, and the light and ſhade of a concerto; and painters of the harmony of colours, and the tone of a picture.

This ſource of pleaſure received from the melodious ſucceſſion of colours or of ſounds muſt not be confounded with the pleaſure received from the repetition of them explained above, though the repetition, or diviſion of muſical notes into bars, ſo as to produce common or triple time, contributes much to the pleaſure of muſic; but in viewing a fixed landſcape nothing like muſical time exiſts; and the pleaſure received therefore from certain ſucceſſions of colours muſt depend only on the more eaſy or diſtinct action of the retina in perceiving ſome colours after others, or in their vicinity, like the facility or even pleaſure with which we act with contrary muſcles in yawning or ſtretching after having been fatigued with a long previous exertion in the contrary direction.

Hence where colours are acquired to be diſtinct, thoſe which are oppoſite to each other, ſhould be brought into ſucceſſion or vicinity; as red and green, orange and blue; yellow and violet; but where colours are required to intermix imperceptibly, or ſlide into each other, theſe ſhould not be choſen; as they might by contraſt appear too glaring or tawdry. Theſe gradations and contraſts of colours have been practically employed both by the painters of landſcape, and by the planters of ornamental gardens; though the theory of this part of the pleaſure derived from viſible objects was not explained before the publication of the paper on ocular ſpectra above mentioned; which is reprinted at the end of the firſt part of Zoonomia, and has thrown great light on the actions of the nerves of ſenſe in conſequence of the ſtimulus of external bodies.

IV. ASSOCIATION OF AGREEABLE SENTIMENTS WITH VISIBLE OBJECTS.

Beſides the pleaſure experienced ſimply by the perception of viſible objects, it has been already ſhown, that there is an additional pleaſure ariſing from the inſpection of thoſe, which poſſeſs novelty, or ſome degree of it; a ſecond additional pleaſure from thoſe, which poſſeſs in ſome degree a repetition of their parts; and a third from thoſe, which poſſeſs a ſucceſſion of particular colours, which either contraſt or ſlide into each other, and which we have termed melody of colours.

We now ſtep forward to the fourth ſource of the pleaſures ariſing from the contemplation of viſible objects beſides that ſimply of perception, which conſiſts in our previous aſſociation of ſome agreeable ſentiment with certain forms or combinations of them. Theſe four kinds of pleaſure ſingly or in combination conſtitute what is generally underſtood by the word Taſte in reſpect to the viſible world; and by parity of reaſoning it is probable, that the pleaſurable ideas received by the other ſenſes, or which are aſſociated with language, may be traced to ſimilar ſources.

It has been ſhown by Biſhop Berkeley, in his ingenious eſſay on viſion, that the eye only acquaints us with the perception of light and colours; and that our idea of the ſolidity of the bodies, which reflect them, is learnt by the organ of touch: he therefore calls our viſion the language of touch, obſerving that certain gradations of the ſhades of colour, by our previous experience of having examined ſimilar bodies by our hands or lips, ſuggeſt our ideas of ſolidity, and of the forms of ſolid bodies; as when we view a tree, it would otherwiſe appear to us a flat green ſurface, but by aſſociation of ideas we know it to be a cylindrical ſtem with round branches. This aſſociation of the ideas acquired by the ſenſe of touch with thoſe of viſion, we do not allude to in the following obſervations, but to the agreeable trains or tribes of ideas and ſentiments connected with certain kinds of viſible objects.

SENTIMENT OF BEAUTY.

Of theſe catenations of ſentiments with viſible objects, the firſt is the ſentiment of Beauty or Lovelineſs; which is ſuggeſted by eaſy-flowing curvatures of ſurface, with ſmoothneſs; as is ſo well illuſtrated in Mr. Burk's Eſſay on the Sublime and Beautiful, and in Mr. Hogarth's analyſis of Beauty; a new edition of which is much wanted ſeparate from his other works.

The ſentiment of Beauty appears to be attached from our cradles to the eaſy curvatures of lines and ſmooth ſurfaces of viſible objects, and to have been derived from the form of the female boſom; as ſpoken of in Zoonomia, Vol. I. Section XVI. on Inſtinct.

Sentimental love, as diſtinguiſhed from the animal paſſion of that name, with which it is frequently accompanied, conſiſts in the deſire or ſenſation of beholding, embracing, and ſaluting, a beautiful object.

The characteriſtic of beauty therefore is, that it is the object of love; and though many other objects are in common language called beautiful, yet they are only called ſo metaphorically, and ought to be termed agreeable. A Grecian temple may give us the pleaſurable idea of ſublimity; a Gothic temple may give us the pleaſurable idea of variety; and a modern houſe the pleaſurable idea of utility; muſic and poetry may inſpire our love by aſſociation of ideas; but none of theſe, except metaphorically, can be termed beautiful; as we have no wiſh to embrace or ſalute them.

Our perception of beauty conſiſts in our recognition by the ſenſe of viſion of thoſe objects, firſt which have before inſpired our love by the pleaſure, which they have afforded to many of our ſenſes: as to our ſenſe of warmth, of touch, of ſmell, of taſte, hunger and thirſt; and ſecondly, which bear any analogy of form to ſuch objects.

When the babe, ſoon after it is born into this cold world, is applied to its mother's boſom, its ſenſe of perceiving warmth is firſt agreeably affected; next its ſenſe of ſmell is delighted with the odour of her milk; then its taſte is gratified by the flavour of it, afterwards the appetites of hunger and of thirſt afford pleaſure by the poſſeſſion of their objects, and by the ſubſequent digeſtion of the aliment; and laſtly, the ſenſe of touch is delighted by the ſoftneſs and ſmoothneſs of the milky fountain, the ſource of ſuch variety of happineſs.

NOTE XIV.—THE THEORY AND STRUCTURE OF LANGUAGE.

Next to each thought aſſociate ſound accords,
And forms the dulcet ſymphony of words.
CANTO III. l. 365.

IDEAS conſiſt of ſynchronous motions or configurations of the extremities of the organs of ſenſe; theſe when repeated by ſenſation, volition, or aſſociation, are either ſimple or complex, as they were firſt excited by irritation; or have afterwards ſome parts abſtracted from them, or ſome parts added to them. Language conſiſts of words, which are the names or ſymbols of ideas. Words are therefore properly all of them nouns or names of things.

Little had been done in the inveſtigation of the theory of language from the time of Ariſtotle to the preſent æra, till Mr. Horne Tooke, the ingenious and learned author of the Diverſions of Purley, explained thoſe undeclined words of all languages, which had puzzled the grammarians, and evinced from their etymology, that they were abbreviations of other modes of expreſſion. Mr. Took obſerves, that the firſt aim of language was to communicate our thoughts, and the ſecond to do it with diſpatch; and hence he divides words into thoſe, which were neceſſary to expreſs our thoughts, and thoſe which are abbreviations of the former; which he ingeniouſly ſtyles the wings of Hermes.

For the greater diſpatch of converſation many words ſuggeſt more than one idea; I ſhall therefore arrange them according to the number and kinds of ideas, which they ſuggeſt; and am induced to do this, as a new diſtribution of the objects of any ſcience may advance the knowledge of it by developing another analogy of its conſtituent parts. And in thus endeavouring to analyze the theory of language I mean to ſpeak primarily of the Engliſh, and occaſionally to add what may occur concerning the ſtructure of the Greek and Latin.

I. CONJUNCTIONS AND PREPOSITIONS.

The firſt claſs of words conſiſts of thoſe, which ſuggeſt but one idea, and ſuffer no change of termination; which have been termed by grammarians CONJUNCTIONS and PREPOSITIONS; the former of which connect ſentences, and the latter words. Both which have been ingeniouſly explained by Mr. Horne Tooke from their etymology to be abbreviations of other modes of expreſſion.

1. Thus the conjunction *if* and *an*, are ſhown by Mr. Tooke to be derived from the imperative mood of the verbs to give and to grant; but both of theſe conjunctions by long uſe appear to have become the name of a more abſtracted idea, than the words give or grant ſuggeſt, as they do not now expreſs

any ideas of perſon, or of number, or of time; all which are generally attendant upon the meaning of a verb; and perhaps all the words of this claſs are the names of ideas much abſtracted, which has cauſed the difficulty of explaining them.

2. The number of Prepoſitions is very great in the Engliſh language, as they are uſed before the caſes of nouns, and the infinitive mood of verbs, inſtead of the numerous changes of termination of the nouns and verbs of the Greek and Latin; which gives greater ſimplicity to our language, and greater facility of acquiring it.

The prepoſitions, as well as the preceding conjunctions, have been well explained by Mr. Horne Tooke; who has developed the etymology of many of them. As the greateſt number of the ideas, we receive from external objects, are complex ones, the names of theſe conſtitute a great part of language, as the proper names of perſons and places; which are complex terms. Now as theſe complex terms do not always exactly ſuggeſt the quantity of combined ideas we mean to expreſs, ſome of the prepoſitions are prefixed to them to add or to deduct ſomething, or to limit their general meaning; as a houſe with a party wall, or a houſe without a roof. Theſe words are alſo derived by Mr. Tooke, as abbreviations of the imperative moods of verbs; but which appear now to ſuggeſt ideas further abſtracted than thoſe generally ſuggeſted by verbs, and are all of them properly nouns, or names of ideas.

II. NOUNS SUBSTANTIVE.

The ſecond claſs of words conſiſts of thoſe, which in their ſimpleſt ſtate ſuggeſt but one idea, as the word man; but which by two changes of termination in our language ſuggeſt one ſecondary idea of number, as the word men; or another ſecondary idea of the genitive caſe, as man's mind, or the mind of man. Theſe words by other changes of termination in the Greek and Latin languages ſuggeſt many other ſecondary ideas, as of gender, as well as of number, and of all the other caſes deſcribed in their grammars; which in Engliſh are expreſſed by prepoſitions.

This claſs of words includes the NOUNS SUBSTANTIVE, or names of things, of common grammars, and may be conveniently divided into three kinds. 1. Thoſe which ſuggeſt the ideas of things believed to poſſeſs hardneſs and figure, as a houſe or a horſe. 2. Thoſe which ſuggeſt the ideas of things, which are not ſuppoſed to poſſeſs hardneſs and figure, except metaphorically, as virtue, wiſdom; which have therefore been termed abſtracted ideas. 3. Thoſe which have been called by metaphyſical writers reflex ideas, and mean thoſe of the operations of the mind, as ſenſation, volition, aſſociation.

Another convenient diviſion of theſe nouns ſubſtantive or names of things may be firſt into general terms, or the names of claſſes of ideas, as man, quadruped, bird, fiſh, animal. 2. Into the names of complex ideas, as this houſe, that dog. 3. Into the names of ſimple ideas, as whiteneſs, ſweetneſs.

A third convenient diviſion of the names of things may be into the names of entire things, whether of real or imaginary being; theſe are the nouns ſubſtantive of grammars. 2. Into the names of the qualities or properties of the former; theſe are the nouns adjective of grammars. 3. The names of more abſtracted ideas as the conjunctions and prepoſitions of grammarians.

Theſe nouns ſubſtantive, or names of entire things, ſuggeſt but one idea in their ſimpleſt form, as in the nominative caſe ſingular of grammars. As the word a ſtag is the name of a ſingle complex idea; but the word ſtags by a change of termination adds to this a ſecondary idea of number; and the word ſtag's, with a comma before the final s, ſuggeſts, in Engliſh, another ſecondary idea of ſomething appertaining to the ſtag, as a ſtag's horn; which is, however, in our language, as frequently expreſſed by the prepoſition *of*, as the horn of a ſtag.

In the Greek and Latin languages an idea of gender is joined with the names of entire things, as well as of number; but in the Engliſh language the nouns, which expreſs inanimate objects, have no genders except metaphorically; and even the ſexes of many animals have names ſo totally different from each other, that they rather give an idea of the individual creature than of the ſex, as bull and cow, horſe and mare, boar and ſow, dog and bitch. This conſtitutes another circumſtance, which renders our language more ſimple, and more eaſy to acquire; and at the ſame time contributes to the poetic excellence of it; as by adding a maſculine or ſeminine pronoun, as he, or ſhe, other nouns ſubſtantive are ſo readily perſonified.

In the Latin language there are five caſes beſides the nominative, or original word, and in the Greek four. Whence the original noun ſubſtantive by change of its termination ſuggeſts a ſecondary idea either correſponding with the genitive, dative, accuſative, vocative, or ablative caſes, beſides the ſecondary ideas of number and gender above mentioned. The ideas ſuggeſted by theſe changes of termination, which are termed caſes, are explained in the grammars of theſe languages, and are expreſſed in ours by prepoſitions, which are called the ſigns of thoſe caſes.

Thus the word Domini, of the Lord, ſuggeſts beſide the primary idea a ſecondary one of ſomething appertaining to it, as templum domini, the temple of the Lord, or the Lord's temple; which in Engliſh is either effected by an addition of the letter s, with a comma before it, or by the prepoſition *of*. This genitive caſe is ſaid to be expreſſed in the Hebrew language ſimply by the locality of the words in ſucceſſion to eachother; which muſt ſo far add to the conciſeneſs of that language,

Thus the word Domino, in the dative caſe, to the Lord, ſuggeſts beſides the primary idea a ſecondary one of ſomething being added to the primary one; which is effected in Engliſh by the prepoſition *to*.

The accuſative caſe, or Dominum, beſides the primary idea implies ſomething having acted upon the object of that primary idea; as felis edit murem, the cat eats the mouſe. This is thus effected in the Greek and Latin by a change of termination of the noun acted upon, but is managed in a more conciſe way in our language by its ſituation in the ſentence, as it follows the verb. Thus if the mouſe in the above ſentence was placed before the verb, and the cat after it, in Engliſh the ſenſe would be inverted, but not ſo in Latin; this neceſſity of generally placing the accuſative caſe after the verb is inconvenient in poetry; though it adds to the conciſeneſs and ſimplicity of our language, as it ſaves the intervention of a prepoſition, or of a change of termination.

The vocative caſe of the Latin language, or Domine, beſides the primary idea ſuggeſts a ſecondary one of appeal, or addreſs; which in our language is either marked by its ſituation in the ſentence, or by the prepoſition O preceding it. Whence this interjection O conveys the idea of appeal joined to the ſubſequent noun, and is therefore properly another noun, or name of an idea, preceding the principal one like other prepoſitions.

The ablative caſe in the Latin language, as Domino, ſuggeſts a ſecondary idea of ſomething being deducted from or by the primary one. Which is perhaps more diſtinctly expreſſed by one of thoſe prepoſitions in our language; which, as it ſuggeſts ſomewhat concerning the adjoined noun, is properly another noun, or name of an idea, preceding the principal one.

When to theſe variations of the termination of nouns in the ſingular number are added thoſe equally numerous of the plural, and the great variety of theſe terminations correſpondent to the three genders, it is evident that the prepoſitions of our own and other modern languages inſtead of the changes of termination add to the ſimplicity of theſe languages, and to the facility of acquiring them.

Hence in the Latin language, beſides the original or primary idea ſuggeſted by each noun ſubſtantive, or name of an entire thing, there attends an additional idea of number, another of gender, and another ſuggeſted by each change of termination, which conſtitutes the caſes; ſo that in this language four ideas are ſuggeſted at the ſame time by one word; as the primary idea, its gender, number, and caſe; the latter of which has alſo four or five varieties. Theſe nouns therefore may properly be termed the abbreviation of ſentences; as the conjuntions and prepoſitions are termed by Mr. Tooke the abbreviation of words; and if the latter are called the wings affixed to the feet of Hermes, the former may be called the wings affixed to his cap.

III. ADJECTIVES, ARTICLES, PARTICIPLES, ADVERBS.

1. The third claſs of words conſiſts of thoſe, which in their ſimpleſt form ſuggeſt two ideas; one of them is an abſtracted idea of the quality of an object, but not of the object itſelf; and the other is an abſtracted idea of its appertaining to ſome other noun called a ſubſtantive or a name of an entire thing.

Theſe words are termed ADJECTIVES, are undeclined in our language in reſpect to caſes, number, or gender; but by three changes of termination they ſuggeſt the ſecondary ideas of greater, greateſt, and of leſs; as the word ſweet changes into ſweeter, ſweeteſt, and ſweetiſh; which may be termed three degrees of compariſon beſides the poſitive meaning of the word; which terminations of *er* and *est* are ſeldom added to words of more than two ſyllables; as thoſe degrees are then moſt frequently denoted by the prepoſitions more and moſt.

Adjectives ſeem originally to have been derived from nouns ſubſtantive, of which they expreſs a quality, as a muſky roſe, a beautiful lady, a ſtormy day. Some of them are formed from the correſpondent ſubſtantive by adding the ſyllable *ly*, or *like*, as a lovely child, a warlike countenance: and in our language it is frequently only neceſſary to put a hyphen between two nouns ſubſtantive for the purpoſe of converting the former one into an adjective, as an eagle-eye, a May-day. And many of our adjectives are ſubſtantives unchanged, and only known by their ſituation in a ſentence, as a German, or a German gentleman. Adjectives therefore are names of qualities, or parts of things; as ſubſtantives are the names of entire things.

In the Latin and Greek languages theſe adjectives poſſeſs a great variety of terminations; which ſuggeſt occaſionally the ideas of number, gender, and the various caſes, agreeing in all theſe with the ſubſtantive, to which they belong; beſides the two original or primary ideas of quality, and of their appertaining to ſome other word, which muſt be adjoined to make them ſenſe. Inſomuch that ſome of theſe adjectives, when declined through all their caſes, and genders, and numbers, in their poſitive, comparative, and ſuperlative degrees, enumerate fifty or ſixty terminations. All which to one, who wiſhes to learn theſe languages, are ſo many new words, and add much to the difficulty of acquiring them.

Though the Engliſh adjectives are undeclined, having neither caſe, gender, nor number; and with this ſimplicity of form poſſeſs a degree of compariſon by the additional termination of [illegible], more than the generality of Latin or Greek adjectives, yet are they leſs adapted to poetic meaſure, as they muſt accompany their correſponding ſubſtantives; from which they are perpetually ſeparated in Greek and Latin poetry.

2. There is a ſecond kind of adjectives, which abound in our language, and in the Greek, but not in the Latin, which are called ARTICLES by the writers of grammar, as the letter *a*, and the word *the*. Theſe, like the adjectives above deſcribed, ſuggeſt two primary ideas, and ſuffer no change of termination in our language, and therefore ſuggeſt no ſecondary ideas.

Mr. Locke obſerves, that languages conſiſt principally of general terms; as it would have been impoſſible to give a name to every individual object, ſo as to communicate an idea of it to others; it would be like reciting the name of every individual ſoldier of an army, inſtead of uſing the general term army. Now the uſe of the article *a*, and *the* in Engliſh, and *ὁ* in Greek, converts general terms into particular ones; this idea of particularity as a quality, or property of a noun, is one of the primary ideas ſuggeſted by theſe articles; and the other is, that of its appertaining to ſome particular noun ſubſtantive, without which it is not intelligible. In both theſe reſpects theſe articles correſpond with adjectives; to which may be added, that our article *a* may be expreſſed by the adjective one or any; and that the Greek article *ὁ* is declined like other adjectives.

The perpetual uſe of the article, beſides its converting general terms into particular ones, contributes much to the force and beauty of our language from another circumſtance, that abſtracted ideas become ſo readily perſonified ſimply by the omiſſion of it; which perhaps renders the Engliſh language better adapted to poetry than any other, ancient or modern: the following proſopopœia from Shakſpeare is thus beautiful.

> She let Concealment like a worm i' th' bud
> Feed on her damask cheek.

And the following line tranſlated from Juvenal by Dr. Johnſon, is much ſuperior to the original, owing to the eaſy perſonification of Worth and Poverty, and to the conſequent conciſeneſs of it.

> Difficile emergunt, quorum virtutibus obstat
> Res angusta domi.
>
> Slow riſes Worth by Poverty depress'd.

3. A third claſs of adjectives includes what are termed Participles, which are allied to the infinitive moods of verbs, and are formed in our language by the addition only of the ſyllable *ing* or *ed*; and are of two kinds, active and paſſive, as loving, loved, from the verb to love. The verbs ſuggeſt an idea of the noun, or thing ſpoken of; and alſo of its manner of exiſtence, whether at reſt, in action,

or in being acted upon; as I lie ſtill, or I whip, or I am whipped; and laſtly, another idea of the time of reſting, acting, or ſuffering; but theſe adjectives called participles, ſuggeſt only two primary ideas, one of the noun, or thing ſpoken of, and another of the mode of exiſtence, but not a third idea of time: and in this reſpect participles differ from the verbs, from which they originate, or which originated from them, except in their infinitive moods.

Nor do they reſemble adjectives only in their ſuggeſting but two primary ideas; but in the Latin and Greek languages they are declined through all the caſes, genders, and numbers, like other adjectives; and change their terminations in the degrees of compariſon.

In our language the participle paſſive, joined to the verb *to be*, for the purpoſe of adding to it the idea of time, forms the whole of the paſſive voice; and is frequently uſed in a ſimilar manner in the Latin language, as I am loved is expreſſed either by amor, or amatus ſum. The conſtruction of the whole paſſive voice from the verb *to be* and the participles paſſive of other verbs, contributes much to the ſimplicity of our language, and the eaſe of acquiring it; but renders it leſs conciſe than perhaps it might have been by ſome ſimple variations of termination, as in the active voice of it.

4. A fourth kind of adjective is called by the grammarians an Adverb; which has generally been formed from the firſt kind of adjectives, as

theſe were frequently formed from correſpondent ſubſtantives; or it has been formed from the third kind of adjectives, called participles; and this is effected in both caſes by the addition of the ſyllable *ly*, as wiſely, charmingly.

This kind of adjective ſuggeſts two primary ideas, like the adjectives, and participles, from which they are derived; but differ from them in this curious circumſtance, that the other adjectives relate to ſubſtantives, and are declined like them in the Latin and Greek languages, as a lovely boy, a warlike countenance; but theſe relate to verbs, and are therefore undeclined, as to act boldly, to ſuffer patiently.

IV. VERBS.

The fourth claſs of words conſiſts of thoſe which are termed VERBS, and which in their ſimpleſt ſtate ſuggeſt three ideas; firſt an idea of the noun, or name of the thing ſpoken of, as a whip. 2. An idea of its mode of exiſtence, whether at reſt, or in action, or in being acted upon. 3. An idea of the time of its exiſtence. Thus "the beadle whipped the beggar," in prolix language might be expreſſed, the beadle with a whip ſtruck in time paſt the beggar. Which three ideas are ſuggeſted by the one word whipped.

Verbs are therefore nouns, or names of entire ideas, with the additional ideas of their mode of exiſtence and of time; but the participles ſuggeſt only the noun, and the mode of exiſtence, without any idea of time; as whipping, or whipped. The infinitive moods of verbs correſpond in their ſignification with the participles; as they alſo ſuggeſt only the noun, or name of the thing ſpoken of, and an idea of its mode of exiſtence, excluding the idea of time; which is expreſſed by all the other moods and tenſes; whence it appears, that the infinitive mood, as well as the participle, is not truly a part of the verb; but as the participle reſembles the adjective in its conſtruction; ſo the infinitive mood may be ſaid to reſemble the ſubſtantive, and it is often uſed as a nominative caſe to another verb.

Thus in the words "a charming lady with a ſmiling countenance," the participle acts as an adjective; and in the words "to talk well commands attention," the infinitive mood acts as the nominative caſe of a noun ſubſtantive; and their reſpective ſignifications are alſo very ſimilar, as whipping, or to whip, mean the exiſtence of a perſon acting with a whip.

In the Latin language the verb in its ſimpleſt form, except the infinitive mood, and the participle, both which we mean to exclude from complete verbs, ſuggeſts four primary ideas, as amo, ſuggeſts the pronoun I, the noun love, its exiſtence in its active ſtate, and the preſent time; which verbs in the Greek and Latin undergo an uncounted variation of termination, ſuggeſting ſo many different ideas in addition to the four primary ones.

We do not mean to aſſert, that all verbs are literally derived from nouns in any language; becauſe all languages have in proceſs of time undergone ſuch great variation; many nouns having become obſolete or have periſhed, and new verbs have been imported from foreign languages, or tranſplanted from ancient ones; but that this has originally been the conſtruction of all verbs, as well as thoſe to whip and to love above mentioned, and innumerable others.

Thus there may appear ſome difficulty in analyzing from what noun-ſubſtantive were formed the verbs to ſtand or to lie; becauſe we have not properly the name of the abſtract ideas from which theſe verbs aroſe, except we uſe the ſame word for the participle and the noun-ſubſtantive, as ſtanding, lying. But the verbs to ſit, and to walk, are leſs difficult to trace to their origin; as we have names for the nouns ſubſtantive, a ſeat, and a walk.

But there is another verb of great conſequence in all languages, which would appear in its ſimpleſt form in our language to ſuggeſt but two primary ideas, as the verb *to be,* but that it ſuggeſts three primary ideas, like other verbs may be underſtood, if we uſe the ſynonimous term to exiſt inſtead of to be. Thus "I exiſt" ſuggeſts firſt the abſtract idea of exiſtence, not including the mode of exiſtence, whether at reſt, or in action, or in ſuffering; ſecondly it adds to that abſtracted idea of exiſtence its real ſtate, or actual reſting, acting, or ſuffering exiſtence; and thirdly the idea of the preſent time: thus the infinitive mood *to be*, and the participle, *being*, ſuggeſt both the abſtract idea of exiſtence, and the actual ſtate of it, but not the time.

The verb *to be* is alſo uſed irregularly to deſignate the parts of time and actual exiſtence; and is then applied to either the active or paſſive participles of other verbs, and called an auxiliary verb; while the mode of exiſtence, whether at reſt or in action, or being acted upon, is expreſſed by the participle, as "I am loving" is nearly the ſame as "I love," amo; and "I am loved," amatus ſum, is nearly the ſame as amor. This mode of application of the verb *to be* is uſed in French as well as in Engliſh, and in the paſſive voice of the Latin, and perhaps in many other languages; and is by its perpetual uſe in converſation rendered irregular in them all, as I am, thou art, he is, would not ſeem to belong to the infinitive mood *to be*, any more than ſum, fui, ſunt, fuerunt, appear to belong to eſſe.

The verb *to have* affords another inſtance of irregular application; the word means in its regular ſenſe to poſſeſs, and then ſuggeſts three ideas like the above verb of exiſtence: firſt the abſtracted idea of the thing ſpoken of, or poſſeſſion; ſecondly, the actual exiſtence of poſſeſſion, and laſtly the time, as I have or poſſeſs. This verb *to have* like the verb *to be* is alſo uſed irregularly to denote parts of paſt time, and is then joined to the paſſive participles alone, as I have eaten: or it is accompanied with the paſſive participle of the verb *to be*, and then with the active participle of another verb, as I have been eating.

There is another word *will* uſed in the ſame irregular manner to denote the parts of future time, which is derived from the verb *to will*; which in its regular uſe ſignifies to exert our volition. There are other words uſed to expreſs other circumſtances attending upon verbs, as may, can, ſhall, all which are probably the remains of verbs otherwiſe obſolete. Laſtly, when we recollect, that in the moods and tenſes of verbs one word expreſſes never leſs than three ideas in our language, and many more in the Greek and Latin; as beſides thoſe three primary ideas the idea of perſon, and of number, are always expreſſed in the indicative mood, and other ideas ſuggeſted in the other moods, we cannot but admire what excellent abbreviations of language are thus achieved; and when we obſerve the wonderful intricacy and multiplicity of ſounds in thoſe languages, eſpecially in the Greek verbs, which change both the beginning and ending of the original word through three voices, and three numbers, with uncounted variations of dialect; we cannot but admire the ſimplicity of modern languages compared to theſe ancient ones; and muſt finally perceive, that all language conſiſts ſimply of nouns, or names of ideas, diſpoſed in ſucceſſion or in combination, all of which are expreſſed by ſeparate words, or by various terminations of the ſame word.

CONCLUSION.

The theory of the progreſſive production of language in the early times of ſociety, and its gradual improvements in the more civilized ones, may be readily induced from the preceding pages. In the commencement of Society the names of the ideas of entire things, which it was neceſſary moſt frequently to communicate, would firſt be invented, as the names of individual perſons, or places, fire, water, this berry, that root; as it was neceſſary perpetually to announce, whether one or many of ſuch external things exiſted, it was ſoon found more convenient to add this idea of number by a change of termination of the word, than by the addition of another word.

As many of theſe nouns ſoon became general terms, as bird, beaſt, fiſh, animal; it was next convenient to diſtinguiſh them when uſed for an individual, from the ſame word uſed as a general term; whence the two articles *a* and *the*, in our language, derive their origin.

Next to theſe names of the ideas of entire things, the words moſt perpetually wanted in converſation would probably conſiſt of the names of the ideas of the parts or properties of things; which might be derived from the names of ſome things, and applied to others, which in theſe reſpects reſembled them; theſe are termed adjectives, as roſy cheek, manly voice, beaſtly action; and ſeem at firſt to have been formed ſimply by a change of termination of their correſpondent ſubſtantives. The comparative degrees of greater and leſs were found ſo frequently neceſſary to be ſuggeſted, that a change of termination even in our language for this purpoſe was produced; and is as frequently uſed as an additional word, as wiſer or more wiſe.

The expreſſion of general ſimilitude, as well as partial ſimilitude, becomes ſo frequently uſed in converſation, that another kind of adjective, called an adverb, was expreſſed by a change of termination, or addition of the ſyllable ly or like; and as adjectives of the former kind are applied to ſubſtantives, and expreſs a partial ſimilitude, theſe are applied to verbs and expreſs a general ſimilitude, as to act heroically, to ſpeak boldly, to think freely.

The perpetual chain of cauſes and effects, which conſtitute the motions, or changing configurations, of the univerſe, are ſo conveniently divided into active and paſſive, for expreſſing the exertions or purpoſes of common life, that it became particularly convenient in all languages to ſubſtitute changes of termination, inſtead of additional nouns, to expreſs, whether the thing ſpoken of was in a ſtate of acting or of being acted upon. This change of termination betokening action or ſuffering conſtitutes the participle, as loving, loved; which, as it expreſſes a property of bodies, is claſſed amongſt adjectives in the preceding pages.

Beſides the perpetual alluſions to the active or paſſive ſtate of things, the comparative times of theſe motions, or changes, were alſo perpetually required to be expreſſed; it was therefore found convenient in all languages to ſuggeſt them by changes of terminations in preference to doing it by additional nouns. At the ſame time the actual or real exiſtence of the thing ſpoken of was perpetually required, as well as the times of their exiſtence, and the active or paſſive ſtate of that exiſtence. And as no converſation could be carried on without unceaſingly alluding to theſe circumſtances, they became in all languages ſuggeſted by changes of termination; which are termed moods and tenſes in grammars and convert the participle above mentioned into a verb; as that participle had originally been formed by adding a termination to a noun, as chaining, and chained, from chain.

The great variety of changes of termination in all languages conſiſts therefore of abbreviations uſed inſtead of additional words; and adds much to the conciſeneſs of language, and the quickneſs with which we are enabled to communicate our ideas; and may be ſaid to add unnumbered wings to every limb of the God of Eloquence.

NOTE. XV.—ANALYSIS OF ARTICULATE SOUNDS.

The tongue, the lips articulate; the throat
With ſoft vibration modulates the note.
CANTO III. l. 367.

HAVING explained in the preceding account of the theory of language that it conſiſts ſolely of nouns, or the names of ideas, diſpoſed in ſucceſſion or combination; I ſhall now attempt to inveſtigate the number of the articulate ſounds, which conſtitute thoſe names of ideas by their ſucceſſions and combinations; and to ſhow by what parts of the organs of ſpeech they are modulated and articulated; whence may be deduced the preciſe number of letters or ſymbols neceſſary to ſuggeſt thoſe ſounds, and form an alphabet, which may ſpell with accuracy the words of all languages.

I. IMPERFECTIONS OF THE PRESENT ALPHABET.

It is much to be lamented, that the alphabet, which has produced and preſerved almoſt all the improvements in other arts and ſciences, ſhould have itſelf received no improvement in modern times; which have added ſo much elucidation to almoſt every branch of knowledge, that can meliorate the condition of humanity. Thus in our preſent alphabets many letters are redundant, others are wanted; ſome ſimple articulate ſounds have two letters to ſuggeſt them; and in other inſtances two articulate ſounds are ſuggeſted by one letter. Some of theſe imperfections in the alphabet of our own language ſhall be here enumerated.

X. Thus the letter x is compounded of ks, or of gz, as in the words excellent, example: ekſellent, egzample.

C. is ſometimes k, at other times s, as in the word a*cc*eſs.

G. is a ſingle letter in go; and ſuggeſts the letters d and the French J in pigeon.

Qu is kw, as quality is kwality.

N G in the words long and in king is a ſimple ſound like the French n, and wants a new character.

SH is a ſimple ſound and wants a new character.

TH is either ſibilant as in thigh; or ſemivocal as in thee; both of which are ſimple ſounds, and want two new characters.

J French exiſts in our words confu*ſ*ion, and concluſion, judge, pigeon, and wants a character. J conſonant, in our language, expreſſes the letters d, and the French j conjoined, as in John, Djon.

CH is either k as in Arch-angel, or is uſed for a ſound compounded of Tſh, as in Children, Tſhildren.

GL is dl, as Glove is pronounced by polite people dlove.

CL is tt, as Cloe is pronounced by polite ſpeakers Tloe.

The ſpelling of our language in reſpect to the pronunciation is alſo wonderfully defective, though perhaps leſs ſo than that of the French; as the words ſlaughter and laughter are pronouced totally different, though ſpelt alike. The word ſough, now pronounced ſuff, was formerly called ſow; whence the iron ſuſed aud received into a ſough acquired the name of ſowmetal; and that received into leſs ſoughs from the former one obtained the name of pigs of iron or of lead; from the pun on the word ſough, into ſow and pigs. Our word jealouſies contains all the vowels, though three of them only were neceſſary; nevertheleſs in the two words abſtemiouſly and facetiouſly the vowels exiſt all of them in their uſual order, and are pronounced in their moſt uſual manner.

Some of the vowels of our language are dipthongs, and conſiſt of two vocal ſounds, or vowels, pronounced in quick ſucceſſion; theſe dipthongs are diſcovered by prolonging the ſound, and obſerving, if the ending of it be different from the beginning; thus the vowel i in our language, as in the word high, if drawn out ends in the ſound of the letter e as uſed in Engliſh; wnich is expreſſed by the letter i in moſt other languages: and the ſound of this vowel i begins with ah, and conſiſts therefore of ah and ee. Whilſt the dipthong ou in our language, as in the word how, begins with ah alſo and ends in oo, and the vowel u of our language, as in the word uſe, is likewiſe a dipthong; which begins with e and ends with oo, as eoo. The French u is alſo a dipthong compounded of a and oo, as aoo. And many other defects and redundancies in our alphabet will be ſeen by peruſing the ſubſequent ſtructure of a more perfect one.

II. PRODUCTION OF SOUNDS.

By our organ of hearing we perceive the vibrations of the air; which vibrations are performed in more or in leſs time, which conſtitutes high or low notes in reſpect to the gammut; but the tone depends on the kind of inſtrument which produces them. In ſpeaking of articulate ſounds they may be conveniently divided firſt into clear continued ſounds, expreſſed by the letters called vowels; ſecondly, Into hiſſing ſounds, expreſſed by the letters called ſibilants; thirdly, Into ſemivocal ſounds, which conſiſt of a mixture of the two former; and, laſtly, Into interrupted ſounds, repreſented by the letters properly termed conſonants.

The clear continued ſounds are produced by the ſtreams of air paſſing from the lungs in reſpiration through the larynx; which is furniſhed with many ſmall muſcles, which by their action give a proper tenſion to the extremity of this tube; and the ſounds, I ſuppoſe, are produced by the opening and cloſing of its aperture; ſomething like the trumpet ſtop of an organ, as may be obſerved by blowing through the wind-pipe of a dead gooſe.

Theſe ſounds would all be nearly ſimilar except in their being an octave or two higher or lower; but they are modulated again, or acquire various tones, in their paſſage through the mouth; which thus converts them into eight vowels, as will be explained below.

The hiſſing ſounds are produced by air forcibly puſhed through certain paſſages of the mouth without being previouſly rendered ſonorous by the larynx; and obtain their ſibilancy from their ſlower vibrations, occaſioned by the mucous membrane, which lines thoſe apertures or paſſages, being leſs tenſe than that of the larynx. I ſuppoſe the ſtream of air is in both caſes frequently interrupted by the cloſing of the ſides or mouth of the paſſages or aperture; but that this is performed much ſlower in the production of ſibilant ſounds, than in the production of clear ones.

The ſemivocal ſounds are produced by the ſtream of air having received quick vibrations, or clear ſound, in paſſing through the larynx, or in the cavity of the mouth; but a part of it, as the outſides of this ſonorous current of air, afterwards receives ſlower vibrations, or hiſſing ſound, from ſome other paſſages of the lips or mouth, through which it then flows. Laſtly the ſtops, or conſonants, impede the current of air, whether ſonorous or ſibilant, for a perceptible time; and probably produce ſome change of tone in the act of opening and cloſing their apertures.

There are other clear ſounds beſides thoſe formed by the larynx; ſome of them are formed in the mouth, as may be heard previous to the enunciation of the letters b, and d, and ga; or during the pronunciation of the ſemivocal letters, v. z. j. and others in ſounding the liquid letters r and l; theſe ſounds we ſhall term oriſonance. The other clear ſounds are formed in the noſtrils, as in pronouncing the liquid letters m. n. and ng. theſe we ſhall term nariſonance.

Thus the clear ſounds, except thoſe above mentioned, are formed in the larynx along with the muſical height or lowneſs of note; but receive afterward a variation of tone from the various paſſages of the mouth: add to theſe that as the ſibilant ſounds conſiſt of vibrations ſlower than thoſe formed by the larynx, ſo a whiſtling through the lips conſiſts of vibrations quicker than thoſe formed by the larynx.

As all ſound conſiſts in the vibrations of the air, it may not be diſagreeable to the reader to attend to the immediate cauſes of thoſe vibrations. When any ſudden impulſe is given to an elaſtic fluid like the air, it acquires a progreſſive motion of the whole, and a condenſation of the conſtituent particles, which firſt receive the impulſe; on this account the currents of the atmoſphere in ſtormy ſeaſons are never regular, but blow and ceaſe to blow by intervals; as a part of the moving ſtream is condenſed by the projectile force; and the ſucceeding part, being conſequently rarefied, requires ſome time to recover its denſity, and to follow the former part: this elaſticity of the air is likewiſe the cauſe of innumerable eddies in it; which are much more frequent than in ſtreams of water; as when it is impelled againſt any oblique plane, it reſults with its elaſtic force added to its progreſſive one.

Hence when a vacuum is formed in the atmoſphere, the ſides of the cavity forcibly ruſh together both by the general preſſure of the ſuperincumbent air, and by the expanſion of the elaſtic particles of it; and thus produce a vibration of the atmoſphere to a conſiderable diſtance: this occurs, whether this vacuity of air be occaſioned by the diſcharge of cannon, in which the air is diſplaced by the ſudden evolution of heat, which as ſuddenly vaniſhes; or whether the vacuity be left by a vibrating ſtring, as it returns from each ſide of the arc, in which it vibrates; or whether it be left under the lid of the valve in the trumpet-ſtop of an organ, or of a child's play trumpet, which continues perpetually to open and cloſe, when air is blown through it; which is cauſed by the elaſticity of the currents, as it occaſions the pauſing guſts of wind mentioned above.

Hence when a quick current of air is ſuddenly broken by any intervening body, a vacuum is produced by the momentum of the proceeding current, between it and the intervening body; as beneath the valve of the trumpet-ſtop above mentioned; and a vibration is in conſequence produced; which with the great facility, which elaſtic fluids poſſeſs of forming eddies, may explain the production of ſounds by blowing through a fiſſure upon a ſharp edge in a common organ-pipe or child's whiſtle; which has always appeared difficult to reſolve; for the leſs vibration an organ-pipe itſelf poſſeſſes, the more agreeable, I am informed, is the tone; as the tone is produced by the vibration of the air in the organ pipe, and not by that of the ſides of it; though the latter, when it exiſts, may alter the tone though not the note, like the belly of a harpſichord or violin.

When a ſtream of air is blown on the edge of the aperture of an organ-pipe about two thirds of it are believed to paſs on the outſide of this edge, and one third to paſs on the inſide of it; but this current of air on the inſide forms an eddy, whether the bottom of the pipe be cloſed or not; which eddy returns upwards, and ſtrikes by quick intervals againſt the original ſtream of air, as it falls on the edge of the aperture, and forces outwards this current of air with quick repetitions, ſo as to make more than two thirds of it, and leſs than two thirds alternately paſs on the outſide; whence a part of this ſtream of air, on each ſide of the edge of the aperture is perpetually ſtopped by that edge; and thus a vacuum and vibration in conſequence, are reciprocally produced on each ſide of the edge of the aperture.

The quickneſs or ſlowneſs of theſe vibrations conſtitute the higher and lower notes of muſic, but they all of them are propagated to diſtant places in the ſame time; as the low notes of a diſtant ring of bells are heard in equal times with the higher ones: hence in ſpeaking at a diſtance from the auditors, the clear ſounds produced in the larynx by the quick vibrations of its aperture, which form the vowels; the tremulous ſounds of the L. R. M. N. NG. which are owing to vibrations of certain apertures of the mouth and noſe, and are ſo ſlow, that the intervals between them are perceived; the ſibilant ſounds, which I ſuppoſe are occaſioned by the air not ruſhing into a complete vacuum, whence the vibrations produced are defective in velocity; and laſtly the very high notes made by the quickeſt vibrations of the lips in whiſtling; are all heard in due ſucceſſion without confuſion; as the progreſſive motions of all ſounds I believe travel with equal velocity, notwithſtanding the greater or leſs quickneſs of their vibrations.

III. STRUCTURE OF THE ALPHABET.

Mute and anteſonant Conſonants, and naſal Liquids.

P. If the lips be preſſed cloſe together and ſome air be condenſed in the mouth behind them, on opening the lips the mute conſonant P begins a ſyllable; if the lips be cloſed ſuddenly during the paſſage of a current of air through them, the air becomes condenſed in the mouth behind them, and the mute conſonant P terminates a ſyllable.

B. If in the above ſituation of the lips a ſound is previouſly produced in the mouth, which may be termed oriſonance, the ſemi-ſonant conſonant B is produced, which like the letter P above deſcribed may begin or terminate a ſyllable.

M. In the above ſituation of the lips, if a ſound is produced through the noſtrils, which ſound is termed nariſonance, the naſal letter M is formed; the ſound of which may be lengthened in pronunciation like thoſe of the vowels.

T. If the point of the tongue be applied to the forepart of the palate, at the roots of the upper teeth, and ſome air condenſed in the mouth behind, on withdrawing the tongue downwards the mute conſonant T is formed; which may begin or terminate a ſyllable.

D. If the tongue be placed as above deſcribed, and a ſound be previouſly produced in the mouth, the ſemiſonant conſonant D is formed, which may begin or terminate a ſyllable.

N. If in the above ſituation of the tongue and palate a ſound be produced through the noſtrils, the naſal letter N is formed, the ſound of which may be elongated like thoſe of the vowels.

K. If the point of the tongue be retracted, and applied to the middle part of the palate; and ſome air condenſed in the mouth behind; on withdrawing the tongue downwards the mute conſonant K is produced, which may begin or terminate a ſyllable.

Ga. If in the above ſituation of the tongue and palate a ſound be previouſly produced in the mouth behind, the ſemiſonant conſonant G is formed, as pronounced in the word go, and may begin or terminate a ſyllable.

NG. If in the above ſituation of the tongue and palate a ſound be produced through the noſtrils; the naſal letter n g is produced, as in king and throng; which is the French n, the ſound of which may be elongated like a vowel and ſhould have an appropriated character, as thus *v*.

Three of theſe letters, P, T, K, are ſtops to the ſtream of vocal air, and are called mutes by grammarians; three, B, D, Ga, are preceded bya little oriſonance; and three, M, N, NG, poſſeſs continued nariſonance, and have been called liquids by grammarians.

SIBILANTS AND SONISIBILANTS.

W. Of the Germans; if the lips be appreſſed together, as in forming the letter P; and air from the mouth be forced between them; the W ſibilant is produced, as pronounced by the Germans, and by ſome of the inferior people of London, and ought to have an appropriated character as thus ʍ.

W. If in the above ſituation of the lips a ſound be produced in the mouth, as in the letter B, and the ſonorous air be forced between them: the ſoniſibilant letter W is produced; which is the common W of our language.

F. If the lower lip be appreſſed to the edges of the upper teeth, and air from the mouth be forced between them, the ſibilant letter F is formed.

V. If in the above ſituation of the lip and teeth a ſound be produced in the mouth, and the ſonorous air be forced between them, the ſoniſibilant letter V is formed.

Th. Sibilant. If the point of the tongue be placed between the teeth, and air from the mouth be forced between them, the Th ſibilant is produced, as in thigh, and ſhould have a proper character, as ϕ

Th. Soniſibilant. If in the above ſituation of the tongue and teeth a ſound be produced in the mouth, and the ſonorous air be forced between them, the ſoniſibilant Th is formed, as in Thee; and ſhould have an appropriated character as θ

S. If the point of the tongue be appreſſed to the forepart of the palate, as in forming the letter T, and air from the mouth be forced between them, the ſibilant letter S is produced.

Z. If in the above ſituation of the tongue and palate a ſound be produced in the mouth, as in the letter D, and the ſonorous air be forced between them, the ſoniſibilant letter Z is formed.

SH. If the point of the tongue be retracted and applied to the middle part of the palate, as in forming the letter K, and air from the mouth be forced between them, the letter Sh is produced, which is a ſimple ſound and ought to have a ſingle character, thus λ.

J. French. If in the above ſituation of the tongue and palate a ſound be produced in the mouth, as in the letter Ga; and the ſonorous air be forced between them; the J conſonant of the French is formed; which is a ſoniſibilant letter, as in the word concluſion, confuſion, pigeon; it ſhould be called Je, and ſhould have a different character from the vowel i, with which it has an analogy, as thus *Y*.

H. If the back part of the tongue be appreſſed to the pendulous curtain of the palate and uvula; and air from behind be forced between them; the ſibilant letter H is produced.

Ch Spaniſh. If in the above ſituation of the tongue and palate a ſound be produced behind; and the ſonorous air be forced between them; the Ch Spaniſh is formed; which is a ſoniſibilant letter, the ſame as the Ch Scotch in the words Bu*ch*anan and lo*ch*: it is alſo perhaps the Welſh guttural expreſſed by their double L as in Lloyd, Lluellen; it is a ſimple ſound, and ought to have a ſingle character as ⌶.

The ſibilant and ſoniſibilant letters may be elongated in pronunciation like the vowels; the ſibilancy is probably occaſioned by the vibrations of the air being ſlower than thoſe of the loweſt muſical notes. I have preferred the word ſoniſibilants to the word ſemivocal ſibilants; as the ſounds of theſe ſoniſibilants are formed in different apertures of the mouth, and not in the larynx like the vowels.

ORISONANT LIQUIDS.

R. If the point of the tongue be appreſſed to the forepart of the palate, as in forming the letters T, D, N, S, Z, and air be puſhed between them ſo as to produce continued ſound, the letter R is formed.

L. If the retracted tongue be appreſſed to the middle of the palate, as in forming the letters K, Ga, NG, Sh, J French, and air be puſhed over its edges ſo as to produce continued ſound, the letter L is formed.

The naſal letters m, n, and ng, are clear tremulous ſounds like R and L, and have all of them been called liquids by grammarians. Beſides the R and L, above deſcribed, there is another oriſonant ſound produced by the lips in whiſtling; which is not uſed in this country as a part of language, and has therefore obtained no character, but is analogous to the R and L; it is alſo poſſible, that another oriſonant letter may be formed by the back part of the tongue and back part of the palate, as in pronouncing H and Ch, which may perhaps be the Welch Ll in Lloyd, Luellin.

FOUR PAIRS OF VOWELS.

A pronounced like au, as in the word call. If the aperture, made by approximating the back part of the tongue to the uvula and pendulous curtain of the palate, as in forming the ſibilant letter H, and the ſoniſibilant letter Ch Spaniſh, be enlarged juſt ſo much as to prevent ſibilancy; and a continued ſound produced by the larynx be modulated in paſſing through it; the letter A is formed, as in ball, wall, which is ſounded like aw in the word awkward; and is the moſt uſual ſound of the letter A in foreign languages; and to diſtinguiſh it from the ſucceeding A might be called A micron; as the aperture of the fauces, where it is produced, is leſs than in the next A.

A pronounced like ah, as in the word hazard. If the aperture of the fauces above deſcribed, between the back part of the tongue and the back part of the palate, be enlarged as much as convenient, and a continued ſound, produced in the larynx, be modulated in paſſing through it; the letter A is formed, as in animal, army, and ought to have an appropriated character in our language, as thus ∀. As this letter A is formed by a larger aperture than the former one, it may be called A mega.

A pronounced as in the words cake, ale. If the retracted tongue by approximation to the middle part of the palate, as in forming the letters R, Ga, NG, Sh, J French, L, leaves an aperture juſt ſo large as to prevent ſibilancy, and ſonorous air from the larynx be modulated in paſſing through it; the letter A is produced, as pronounced in the words whale, ſale, and ought to have an appropriated character in our language, as thus ϑ; this is expreſſed by the letter E in ſome modern languages, and might be termed E micron; as it is formed by a leſs aperture of the mouth than the ſucceeding E.

E pronounced like the vowel a, when ſhort, as in the words emblem, dwelling. If the aperture above deſcribed between the retracted tongue and the middle of the palate be enlarged as much as convenient, and ſonorous air from the larynx be modulated in paſſing through it, the letter E is formed, as in the words egg, herring; and as it is pronounced in moſt foreign languages, and might be called E mega to diſtinguiſh it from the preceding E.

I pronounced like e in keel. If the point of the tongue by approximation to the forepart of the palate, as in forming the letters T, D, N, S, Z, R, leaves an aperture juſt ſo large as to prevent ſibilancy, and ſonorous air from the larynx be modulated in paſſing through it; the vowel I is produced, which is in our language generally repreſented by e when long, as in the word keel; and by i when ſhort, as in the word it, which is the ſound of this letter in moſt foreign languages; and may be called E micron to diſtinguiſh it from the ſucceeding E or Y.

Y, when it begins a word, as in youth. If the aperture above deſcribed between the point of the tongue, and the forepart of the palate be enlarged as much as convenient, and ſonorous air from the larynx be modulated in paſſing through it, the letter Y is formed; which when it begins a word, has been called Y conſonant by ſome, and by others has been thought only a quick pronunciation of our e, or the i of foreign languages; as in the word year, yellow; and may be termed E mega, as it is formed by a larger aperture than the preceding e or i.

O pronounced like oo, as in the word fool. If the lips by approximation to each other, as in forming the letters P, B, M, W ſibilant, W ſoniſibilant, leave an aperture juſt ſo wide as to prevent ſibilancy; and ſonorous air from the larynx be modulated in paſſing through it; the letter O is formed, as in the words cool, ſchool, and ought to have an appropriated character as thus ꝏ, and may be termed o micron to diſtinguiſh it from the ſucceeding o.

O pronounced as in the word cold. If the aperture above deſcribed between the approximated lips be enlarged as much as convenient; and ſonorous air from the larynx be modulated in paſſing through it, the letter o is formed, as in ſole, coal, which may be termed o mega, as it is formed in a larger aperture than the preceding one.

CONCLUSION.

The alphabet appears from this analyſis of it to conſiſt of thirty-one letters, which ſpell all European languages.

Three mute conſonants, P, T, K.

Three anteſonant conſonants, B, D, Ga.

Three nariſonant liquids, M, N, NG.

Six ſibilants, W, German, F, Th, S, Sh, H.

Six ſoniſibilants, W, V, Th, Z, J French, Ch Spaniſh,

Two oriſonant liquids, R. L.

Eight vowels, Aw, ah, a, e, i, y, oo, o.

To theſe thirty-one characters might perhaps be added one for the Welſh, L, and another for whiſtling with the lips; and it is poſſible, that ſome ſavage nations, whoſe languages are ſaid to abound with gutturals may pronounce a mute con-

conſonant, as well as an anteſonant one, and perhaps another nariſonant letter, by appreſſing the back part of the tongue to the back part of the palate, as in pronouncing the H, and Ch Spaniſh.

The philoſophical reader will perceive that theſe thirty one ſounds might be expreſſed by fewer characters referring to the manner of their production. As ſuppoſe one character was to expreſs the anteſonance of B, D, Ga; another the oriſonance of R, L; another the ſibilance of W, S, Sh, H; another the ſoniſibilance of W, Z, J French, Ch, Spaniſh; another to expreſs the more open vowels; another the leſs open vowels; for which the word micron is here uſed, and for which the word mega is here uſed.

Then the following characters only might be neceſſary to expreſs them all; P alone, or with anteſonance B; with nariſonance M; with ſibilance W German; with ſoniſibilance W; with vocality, termed micron OO; with vocality, termed mega O.

T alone, or with the above characters added to it, would in the ſame manner ſuggeſt D, N, S, Z, EE, Y, and R with a mark for oriſonance.

K alone, or with the additional characters, would ſuggeſt Ga, NG, Sh, J French, A E, and L, with a mark for oriſonance.

F alone, or with a mark for ſoniſibilance, V.

Th alone, or with a mark for ſoniſibilance, Th.

H alone, or with a mark for ſoniſibilance, Ch Spaniſh, and with a mark for leſs open vocality aw, with another for more open vocality ah.

Whence it appears that ſix ſingle characters, for the letters P, T, K, F, Th, H, with ſeven additional marks joined to them for anteſonance, nariſonance, oriſonance, ſibilance, ſoniſibilance, leſs open vocality, and more open vocality; being in all but thirteen characters, may ſpell all the European languages.

I have found more difficulty in analyzing the vowels than the other letters; as the apertures, through which they are modulated, do not cloſe; and it was therefore leſs eaſy to aſcertain exactly, in what part of the mouth they were modulated; but recollecting that thoſe parts of the mouth muſt be more ready to uſe for the purpoſe of forming the vowels, which were in the habit of being exerted in forming the other letters; I rolled up ſome tin foil into cylinders about the ſize of my finger; and ſpeaking the vowels ſeparately through them, found by the impreſſions made on them, in what part of the mouth each of the vowels was formed with ſomewhat greater accuracy, but not ſo as perfectly to ſatisfy myſelf.

The parts of the mouth appeared to me to be thoſe in which the letters P, I, K, and H, are produced; as thoſe, where the letters F and Th are formed, do not ſuit the production of mute or anteſonant conſonants; as the interſtices of the teeth would occaſion ſome ſibilance; and theſe apertures are not adapted to the formation of vowels on the ſame account.

The two firſt vowels aw and ah being modulated in the back part of the mouth, it is neceſſary to open wide the lips and other paſſages of the mouth in pronouncing them; that thoſe paſſages may not again alter their tone; and that more ſo in pronouncing ah, than aw; as the aperture of the fauces is opened wider, where it is formed, and from the greater or leſs ſize of theſe apertures uſed in forming the vowels by different perſons, the tone of all of them may be ſomewhat altered as ſpoken by different orators.

I have treated with greater confidence on the formation of articulate ſounds, as I many years ago gave conſiderable attention to this ſubject for the purpoſe of improving ſhorthand; at that time I contrived a wooden mouth with lips of ſoft leather, and with a valve over the back part of it for noſtrils, both which could be quickly opened or cloſed by the preſſure of the fingers, the vocality was given by a ſilk ribbon about an inch long and a quarter of an inch wide ſtretched between two bits of ſmooth wood a little hollowed; ſo that when a gentle current of air from bellows was blown on the edge of the ribbon, it gave an agreeable tone, as it vibrated between the wooden ſides, much like a human voice. This head pronounced the p, b, m, and the vowel a, with ſo great nicety as to deceive all who heard it unſeen, when it pronounced the words mama, papa, map, and pam; and had a moſt plaintive tone, when the lips were gradually cloſed. My other occupations prevented me from proceeding in the further conſtruction of this machine; which might have required but thirteen movements, as ſhown in the above analyſis, unleſs ſome variety of muſical note was to be added to the vocality produced in the larnyx; all of which movements might communicate with the keys of a harpſichord or forte piano, and perform the ſong as well as the accompaniment; or which if built in a gigantic form might ſpeak ſo loud as to command an army or inſtruct a crowd.

I conclude this with an agreeable hope, that now war is ceaſed, the active and ingenious of all nations will attend again to thoſe ſciences, which better the condition of human nature; and that the alphabet will undergo a perfect reformation, which may indeed make it more difficult to trace the etymologies of words, but will much facilitate the acquiſition of modern languages; which as ſcience improves and becomes more generally diffuſed, will gradually become more diſtinct and accurate than the ancient ones; as metaphors will ceaſe to be neceſſary in converſation, and only be uſed as the ornaments of poetry.

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OF

THE ADDITIONAL NOTES.

NOTE I. SPONTANEOUS VITALITY OF MICROSCOPIC ANIMALS.

I. Spontaneous vital production not contrary to ſcripture; to be looked for only in the ſimpleſt organic beings; ſuppoſed want of analogy no argument againſt it, as this equally applies to all new diſcoveries. II. The power of reproduction diſtinguiſhes organic beings; which are gradually enlarged and improved by it. III. Microſcopic animals produced from all vegetable and animal infuſions; generate others like themſelves by ſolitary reproduction; not produced from eggs; conferva fontinalis; mucor. III. Theory of ſpontaneous vitality. Animal nutrition; vegetable; ſome organic particles have appetencies to unite, others propenſities to be united; buds of trees; ſexual reproduction; analogy between generation and nutrition; laws of elaſticity not underſtood; dead animalcules recover life by heat and moiſture; chaos redivivum; vorticella; ſhell-ſnails; eggs and ſeeds; hydra. Claſſes of microſcopic animals; general remarks.

NOTE II. FACULTIES OF THE SENSORIUM.

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NOTE III. VOLCANOES.

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NOTE IV. MUSQUITO.

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NOTE VI. HIEROGLYPHIC CHARACTERS.

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Bergeret's Botanical Nomenclature; Biſhop Wilkins's Real Character and Philoſophical Language.

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NOTE X. EVE FROM ADAM'S RIB.

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NOTE XII. CHEMICAL THEORY OF ELECTRICITY AND MAGNETISM.

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THE END.

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